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IR-4 Ornamental Horticulture Program Whitefly Efficacy:

Greenhouse Whitefly (*Trialeurodes vaporariorum*) Silverleaf Whitefly B Biotype (*Bemisia tabaci* B Biotype) Silverleaf Whitefly Q Biotype (*Bemisia tabaci* Q Biotype)

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Abstract

Whiteflies are significant pests of ornamental horticulture crops. Three whiteflies species and biotypes contribute to crop production losses in the United States: greenhouse whitefly (*Trialeurodes vaporariorum*), silverleaf whitefly B biotype (*Bemisia tabaci* B Biotype), and silverleaf whitefly Q biotype (*Bemisia tabaci* Q Biotype). From 2002 through 2013, 87 products or rotational/tank mix treatments comprised of 49 different active ingredients were tested through this screening program. In addition to research collected through the IR-4 program, this summary includes a review of experiments conducted from 2004 to 2013 on ornamental horticulture crops. The best products for Q biotype eradication, and those that should be reserved for critical situations, were Judo and Safari. However, Avid, Sanmite, and TriStar also demonstrated effective control and should be utilized routinely as part of the overall management program for Bemisia whiteflies. Mycoinsecticides under these testing conditions did not perform as well as anticipated for Q biotype whitefly management. Several new products that are included in the IR-4 Whitefly efficacy project looked promising based on their efficacy relative to standards. These include A20520A, GF-2626, GF-2860 and NNI-0101. Further research is needed to obtain additional efficacy data to recommend actions to register or amend labels for these pests. Studies on resistance development indicated potential for Q biotype resistance under intense insecticide pressure.

Introduction

Whiteflies are significant pests of ornamental horticulture crops. Three whiteflies species and biotypes contribute to crop production losses in the United States: greenhouse whitefly (*Trialeurodes vaporariorum*), silverleaf whitefly B biotype (*Bemisia tabaci* B Biotype), and silverleaf whitefly Q biotype (*Bemisia tabaci* Q Biotype).

In late 2004, the *Bemisia tabaci* Q biotype whitefly was first isolated in the United States. During 2005, 22 states were identified with Q populations; however, through significant efforts to educate growers and propagators no new states were identified with Q populations in 2006. Two additional states were discovered with this whitefly in 2007, one in 2008 and the latest state in 2010.

In early 2005, IR-4 along with members of the Ad Hoc Bemisia tabaci Q biotype Task Force initiated a project to determine efficacy of several insecticides to manage this newly introduced biotype. While IR-4 provided initial funds, several researchers wanted to rapidly provide answers to the growers and conducted research with minimal outside funding. From 2002 through 2013, 87 products or rotational/tank mix treatments comprised of 49 different active ingredients were tested through this screening program. Also, we reviewed available ornamental trials published in the Arthropod Management Tests to check efficacy of experimental and registered insecticides on whiteflies. This report is a brief summary of available data from this program.

Materials and Methods

From 2004 to 2013, 76 treatments were tested in eighteen trials through the IR-4 Program and members of the Ad Hoc Bemisia tabaci Q biotype Task Force as drench or foliar applications against primarily Q biotype populations, although in several experiments there were mixed populations with the B biotype was also present (Table 1). In addition, thirteen trials were conducted on B biotype populations, and two experiments conducted on the greenhouse whitefly. Treatments were applied when population levels were sufficient to yield statistically meaningful data. A minimum of four plants (replicate treatments) were required with most researchers exceeding this minimum. Population counts were recorded at various intervals after initial application. Any phytotoxicity was noted and described. For more detailed materials and methods, including application rates for various products, please visit

http://ir4.rutgers.edu/ornamental/OrnamentalDrafts.cfm to view and download these protocols.

Products were supplied to researchers by manufacturers to eleven researchers involved in the testing. For contact information and research locations, please see the list of researchers in Appendix 2.

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.

Acelepryn (DPX- E2Y45)ChlorantraniliproleDuPontDrench151 ml per 100 gal2A20520AcyantraniliproleSyngentaFoliar19 oz2A20520AcyantraniliproleSyngentaFoliar8 fl oz per 100 gal2Agri-50PolycaccharidesHortiCentreFoliar53 oz per 100 gal2Aria 50 SGFlonicamidFMCDrench120 g per 100 gal1Foliar6.0 g per 100 gal1Aria 50 SGFlonicamidFMCDrench120 g per 100 gal1Aria 50 SGFloricamidFMCDrench120 g per 100 gal1	Product	Active Ingredient(s)	Manufacturer	Rate(s)	Fested	# Trials
E2Y45)6.47 fl oz per 100 gal2A20520AcyantraniliproleSyngentaFoliar19 oz2Agri-50PolycaccharidesHortiCentreFoliar53 oz per 100 gal2Aria 50 SGFlonicamidFMCDrench120 g per 100 gal1Foliar6.47 fl oz per 100 gal1Aria 50 SGFlonicamidFMCDrench120 g per 100 gal1Aria 50 SGFlonicamidFMCDrench120 g per 100 gal1Aria 60 g per 100 gal110 g per 100 gal11Aria 60 s per 100 gal1110 g per 100 gal1Aria 60 s per 100 gal1110 g per 100 gal1	Acelepryn (DPX-	Chlorantraniliprole	DuPont	Drench	151 ml per 100 gal	2
A20520AcyantraniliproleSyngentaFoliar19 oz2A20520AcyantraniliproleSyngentaFoliar8 fl oz per 100 gal2Agri-50PolycaccharidesHortiCentreFoliar53 oz per 100 gal2Aria 50 SGFlonicamidFMCDrench120 g per 100 gal1Foliar60 g per 100 gal1Image: second conduct of the second condu	E2Y45)				6.47 fl oz per 100 gal	2
A20520AcyantraniliproleSyngentaFoliar8 fl oz per 100 gal2Agri-50PolycaccharidesHortiCentreFoliar53 oz per 100 gal2Aria 50 SGFlonicamidFMCDrench120 g per 100 gal1Foliar60 g per 100 gal1Image: Applied on the second sec				Foliar	19 oz	2
Agri-50PolycaccharidesHortiCentreFoliar53 oz per 100 gal2Aria 50 SGFlonicamidFMCDrench120 g per 100 gal1Foliar60 g per 100 gal1Image: Second secon	A20520A	cyantraniliprole	Syngenta	Foliar	8 fl oz per 100 gal	2
Agri-50PolycaccharidesHortiCentreFoliar53 oz per 100 gal2Aria 50 SGFlonicamidFMCDrench120 g per 100 gal1Foliar60 g per 100 gal1120 g per 100 gal1					16 fl oz per 100 gal	2
Aria 50 SGFlonicamidFMCDrench120 g per 100 gal1Foliar60 g per 100 gal1120 g per 100 gal34 oz per 100 gal1Arrid 0 15ECAbsence in	Agri-50	Polycaccharides	HortiCentre	Foliar	53 oz per 100 gal	2
Foliar 60 g per 100 gal 1 120 g per 100 gal 3 4 oz per 100 gal 1	Aria 50 SG	Flonicamid	FMC	Drench	120 g per 100 gal	1
120 g per 100 gal 3 4 oz per 100 gal 1				Foliar	60 g per 100 gal	1
4 oz per 100 gal 1 Arrid 0 15EC Abarrastin					120 g per 100 gal	3
Assid 0.15EC Absence Summaria Estima 4.6 as non 100 and 1					4 oz per 100 gal	1
Avid 0.15EC Abamecun Syngenta Foliar 4 li oz per 100 gal 1	Avid 0.15EC	Abamectin	Syngenta	Foliar	4 fl oz per 100 gal	1
8 fl oz per 100 gal 5					8 fl oz per 100 gal	5
Avid + ScimitarAbamectin + lambdaSyngentaFoliar8 oz + 5 oz per 100 gal1	Avid + Scimitar	Abamectin + lambda	Syngenta	Foliar	8 oz + 5 oz per 100 gal	1
cyhalothrin		cyhalothrin				
Avid + TameAbamectin +Syngenta +Foliar8 oz + 16 oz per 100 gal1	Avid + Tame	Abamectin +	Syngenta +	Foliar	8 oz + 16 oz per 100 gal	1
Azatin XLAzadirachtinOHPFoliar16 fl oz per 100 gal2	Azatin XL	Azadirachtin	OHP	Foliar	16 fl oz per 100 gal	2
BotaniGard 22WPBeauveria bassianaLaverlamFoliar32 oz per 100 gal3	BotaniGard 22WP	Beauveria bassiana	Laverlam	Foliar	32 oz per 100 gal	3
284 g per 100 gal 2					284 g per 100 gal	2
48 oz per 100 gal 1					48 oz per 100 gal	1
BotaniGard 22WP +Beauveria bassianaFoliar32 oz + 50 oz1Tricon	BotaniGard 22WP + Tricon	Beauveria bassiana		Foliar	32 oz + 50 oz	1
BotaniGard ES Beauveria bassiana BioWorks, Foliar 5 ml per Liter 2	BotaniGard ES	Beauveria bassiana	BioWorks,	Foliar	5 ml per Liter	2
Laverlam 32 fl oz per 100 gal 1			Laverlam		32 fl oz per 100 gal	1
64 fl oz per 100 gal 3					64 fl oz per 100 gal	3
BugOilMineral OilFoliar128 fl oz per 100 gal1	BugOil	Mineral Oil		Foliar	128 fl oz per 100 gal	1
256 fl oz per 100 gal 4					256 fl oz per 100 gal	4
Celero 16WSGClothianidinNo longerDrench3.4 g per 3 gal1	Celero 16WSG	Clothianidin	No longer	Drench	3.4 g per 3 gal	1
available 4 oz per 100 gal 1			available		4 oz per 100 gal	1
6.3 oz per 100 gal 1					6.3 oz per 100 gal	1
Foliar 4 oz per 100 gal 2				Foliar	4 oz per 100 gal	2
Celero / Sanmite Foliar 4 oz / 4 oz 1	Celero / Sanmite			Foliar	4 oz / 4 oz	1
Discus Imidacloprid + Bayer Foliar 50 oz per 100 gal 1 bifenthrin	Discus	Imidacloprid + bifenthrin	Bayer	Foliar	50 oz per 100 gal	1
Distance 0.86EC Pyriproxifen Valent Foliar 8 fl oz per 100 gal 4	Distance 0.86EC	Pyriproxifen	Valent	Foliar	8 fl oz per 100 gal	4
DPX-HGW85 DuPont Drench 6.47 fl oz per 100 gal 1	DPX-HGW85		DuPont	Drench	6.47 fl oz per 100 gal	1
9.7 fl oz per 100 gal 1					9.7 fl oz per 100 gal	1
12.94 fl oz per 100 gal 1					12.94 fl oz per 100 gal	1
Dursban Chlorpyrifos Dow Foliar 8 oz per 100 gal 1	Dursban	Chlorpyrifos	Dow	Foliar	8 oz per 100 gal	1
Eco E-rase Jojoba oil Foliar 64 fl oz per 100 gal 1	Eco E-rase	Jojoba oil		Foliar	64 fl oz per 100 gal	1
256 fl oz per 100 gal 1					256 fl oz per 100 gal	1
EcoTrol EC Rosemary EcoSmart Foliar 10 fl oz per 100 gal 3	EcoTrol EC	Rosemary Oil/Peppermint Oil	EcoSmart	Foliar	10 fl oz per 100 gal	3
Endeavor Pymetrozine Valent Foliar 2.84 g per 100 gal 3	Endeavor	Pymetrozine	Valent	Foliar	284 g per 100 gal	3

Table 1. List of Products and Rates Tested from 2005 to 2013.

Product	Active Ingredient(s)	Manufacturer	Rate(s) Tested		Rate(s) Tested		# Trials
Enstar II	Kinoprene	Wellmark	Foliar	10 oz per 100 gal	1		
Fertilome Triple	Neem	VPG	Foliar	100 fl oz per 100 gal	1		
Action Plus EC	Oil/Pyrethrins/PB						
Flagship 25WG,	Thiamethoxam	Syngenta	Drench	10.2 g per 3 gal	1		
Meridian 25WG				4 oz per 100 gal	4		
				5 oz per 100 gal	1		
				6 oz per 100 gal	1		
			Foliar	1oz per 100 gal	1		
				2 oz per 100 gal	6		
				3 oz per 100 gal	5		
				4 oz per 100 gal	1		
				5 oz per 100 gal	2		
				6 oz per 100 gal	1		
			T 1'	8.5 oz per 100 gal	1		
Flagship / Sanmite	0	D	Foliar	4 oz / 4 oz per 100 gal			
Forbid 2SC	Spiromesifen	Bayer	Foliar	2 fl oz per 100 gal	1		
				4 fl oz per 100 gal	1		
GF-2626		Dow	Foliar	5.5 fl oz per 100 gal	2		
				11 fl oz per 100 gal	2		
GF-2860		Dow	Foliar	2 oz per 100 gal	2		
				2.75 oz per 100 gal	2		
				3.5 oz per 100 gal	4		
				7 oz per 100 gal	2		
Judo 4F	Spiromesifen	OHP	Foliar	2 fl oz per 100 gal	2		
				4 fl oz per 100 gal	12		
				8 fl oz per 100 gal	6		
				12 fl oz per 100 gal	2		
Judo / Avid		OHP /	Foliar	4 fl oz / 8 fl oz per 100 gal	2		
		Syngenta	D 1	0.00.7			
BYI 8330, Kontos	Spirotetramat	OHP	Drench	0.38 fl oz per 100 gal	1		
				0.64 fl oz per 100 gal			
				0.9611 oz per 100 gal			
				1.28 II OZ per 100 gal	1		
				0.042 m per 6 pot	1		
				0.07 ml per 6" pot	1		
				0.105 m per 6" pot	1		
				0.1 ml per L soil	1		
			Foliar	1.7 fl.oz per 100 gal	8		
			1 onu	2.0 fl oz per 100 gal	2		
				2.5 oz per 100 gal	2		
				3.4 fl oz per 100 gal	3		
Marathon II	Imidacloprid	OHP	Drench	1.7 fl oz per 1000 pots	4		
				2.55 ml per 3 gal	1		
				5.4 fl oz per 100 gal	1		
			Foliar	1.7 fl oz per 100 gal	6		
				2 fl oz per 100 gal	6		
Merit 75WP	Imidacloprid	Bayer	Drench	2.1 oz per 100 gal	1		
	1		Foliar	0.5 oz per 100 gal	1		
Marathon /			Drench/	3.4 fl oz per 1000 pots /	1		
Marathon			Foliar	1.7 fl oz per 100 gal			
Marathon /			Drench/	3.4 fl oz per 1000 pots /	1		
Marathon / Avid			Foliar	1.7 fl oz per 100 gal / 8 oz			
				per 100 gal			

Product	Active Ingredient(s)	Manufacturer	Rate(s) Tested		# Trials
MBI-203	Chromobacterium	Marrone	Foliar	2 lb per 100 gal	4
	subtsugae strain			4 lb per 100 gal	4
1001	PRAA4-1T				
MBI-206	Burkholderia sp.	Marrone	Foliar	I gal per 100 gal	
M. (52	strain A396)	N	E.L.	2 gal per 100 gal	2
Met 52	Metarhizium	Novozymes	Foliar	15 oz per 100 gal	2
	anisopilae F52			20 oz per 100 gal	1
MilStop	Dotaccium	DioWorks	Folior	2.5 lb par 100 gal	1
Milistop	bicarbonate	DIOWOIKS	Folia	2.5 10 per 100 gar	1
M Pede	Potassium salts of	Dow	Foliar	0.01%	1
M-1 Cuc	fatty acids	DOW	1 Onai	0.25%	1
	fatty delus			1 gal per 100 gal	1
Naturalis B	Reauveria bassiana	Trov	Foliar	64 fl oz per 100 gal	3
	ATCC 74040	noy	1 onu		5
NNI-0101	Pyrifluquinazon	Nichino	Foliar	1.6 fl oz per 110 gal	2
	v 1			3.2 fl oz per 100 gal	4
				6.4 fl oz per 100 gal	2
NoFly	Paecilomyces	Natural	Foliar	2 g per Liter	2
	fumosoroseus S97	Industries		4 g per Liter	2
				7 oz per 100 gal	1
				14 oz per 100 gal	1
				16 oz per 100 gal	1
				28 oz per 100 gal	1
				42 oz per 100 gal	1
				50 oz per 100 gal	2
				100 oz per 100 gal	2
Organocide	Sesame oil/Refined fish oil	Organic Labs	Foliar		1
Ornazin 3%EC	Azadirachtin	OHP	Foliar	10 fl oz per 100 gal	1
Orthene TTO	Acephate	Valent	Foliar	8 oz per 100 gal	1
Orthene + Tame	Acephate +		Foliar	5.33 oz + 10.67 fl oz per	1
	fenpropathrin			100 gal	1
				5.33 oz + 12 fl oz per 100	
				gal	
Orthene + Tame /	Acephate +		Foliar	5.33 oz + 12 fl oz / 8 fl oz	1
Avid	fenpropathrin /			per 100 gal	
	abamectin				
Ortho Volck Oil	Petroleum Oil	Scotts	Foliar	250 fl oz per 100 gal	1
Spray 97% EC		OND.	T 11		
Pedestal	Novaluron	OHP	Foliar	8 fl oz per 100 gal	2
D (1	X · C	C DRO	F 1'	10 fl oz per 100 gal	1
Preferal	Isaria fumosoroseus	Sepro	Foliar	14 oz per 100 gal	2
Droud 2	Thuma Oil	DioHumoNatia	Foliar	20 02 per 100 gal	2
		s	Follar	r gai per 100 gai	2
Pyranica 3EC	Tebufenpyrad	NuFarm	Foliar	16 fl oz per 100 gal	1
QRD400	1.7	Not available	Foliar	0.5%	1
				1.0%	1
QRD400 + Biotune		Not available	Foliar	1.0% + 0.2%	1
Revoke			Foliar	2 gal mixed with 1 gal	1

Product	Active Ingredient(s)	Manufacturer	Rate(s)	Rate(s) Tested	
Safari 20SG	Dinotefuran	Valent	Drench	1.5 oz per 100 gal	1
				3 oz per 100 gal	3
				6 oz per 100 gal	4
				8 oz per 100 gal	6
				9 oz per 100 gal	1
				12 oz per 100 gal	8
				24 oz per 100 gal	3
			Foliar	3 oz per 100 gal	1
				4 oz per 100 gal	10
				6 oz per 100 gal	4
				8 oz per 100 gal	14
Safari 25WG	Dinotefuran	Valent	Drench	12 oz per 100 gal	1
				24 oz per 100 gal	2
Safer Insect Killing	Insecticidal Soap		Foliar	250 fl oz per 100 gal	1
Soap 50%LC	1			1 0	
Sanmite/GWN 1725	Pyridaben	Gowan	Foliar	4 oz per 100 gal	6
				1 0	
Scimitar	Lambda-Cyhalothrin	Syngenta	Foliar	5 oz per 100 gal	1
Sorbitol Octanoate	Sorbitol octanoate	AVA	Foliar	0.005%	1
		Chemical			
		Ventures			
Sucrocide	Sucrose octanoate	AVA	Foliar	1 gal mixed with 0.5 gal	1
	ester	Chemical			
		Ventures			
Synergy (Suffoil X)	Petroleum Oil	BioWorks	Foliar	1%	1
Talus			Foliar	9 oz per 100 gal	2
	Buprofezin	SePro		18 oz per 100 gal	1
Talus 40SC				9 fl oz per 100 gal	1
Tame	Fenpropathrin	Valent	Foliar	16 oz per 100 gal	1
TickEx EC	Metarhizium	Novozymes	Foliar	1.7 ml per Liter	2
	anisopliae F52			-	
TriCon (BW420)	Sodium	Bioworks	Foliar	0.8%	1
	tetraborohydrate			50 fl oz per 100 gal	1
	decahydrate				
TriStar 0.8EC	Acetamiprid	Cleary	Foliar	2 fl oz per 100 gal	1
TriStar 30SG	Acetamiprid	Cleary	Foliar	4 oz per 100 gal	5
	-			5.3 oz per 100 gal	3
				112 g per 100 gal	1
				224 g per 100 gal	1
TriStar 30SG /	Acetamiprid /	Cleary /	Foliar	5. oz / 4 oz per 100 gal	1
Sanmite	Pyridaben	Gowan			
TriStar 70WSP	Acetamiprid	Cleary	Drench	1.9 g per 3 gal	1
		Cleary	Foliar	1.7 oz per 100 gal	1
				2.25 oz per 100 gal	2
				2.75 oz per 100 gal	1
				4 oz per 100 gal	1
				96 g per 100 gal	3
Ulta-Fine Oil	Paraffinic Oil	Whitmire	Foliar	1 gal per 100 gal	1
Ultra Pure Oil	Petroleum Oil	BASF	Foliar	1 gal per 100 gal	3

Results

Greenhouse Whitefly

Davis 2005a. In 2005, Davis and Smitley conducted an experiment comparing efficacy of several insecticides applied foliar or drench on greenhouse whiteflies (*Trialeurodes vaporariorum*) in marigold (Table 2). All foliar treatments except the Avid application were applied with B-1956, a surfactant, added at a rate of 2 fl oz/100 gal. All of the treatments except the Marathon drench and the GWN 1725 treatments were repeated on 19 Aug. Whitefly larvae and pupae were counted on 3 leaves.

The whitefly population was increasing throughout the test. Larvae were the predominant stage until early Sep when adults began to emerge and re-infest the plants. Foliar sprays with GWN 1725, Forbid, Safari, Marathon II, Tristar, and Flagship all gave better than 90% control on 25 Aug (Table 3); Marathon II applied as a soil drench also gave over 90% control. All products continued to suppress whiteflies through 6 Sep.

 Table 2. *Efficacy of foliar and drench applications for Greenhouse Whitefly on Marigold 'Queen Sophia' – Application Rates and Dates, Davis, 2005a.

Treatment (A stive Ingradient)	Application Method –	Application Dates		
Treatment (Active Ingreutent)	Rate per 100 gal	8/08/05	8/19/05	
Avid 0.15EC (abamectin)	Foliar – 4 fl oz	Х	X	
Flagship 25WG (thiamethoxam)	Foliar – 4 oz	X	X	
Forbid 2SC (spiromesifen)	Foliar – 2 fl oz	X	X	
Forbid 2SC (spiromesifen)	Foliar – 4 fl oz	X	X	
GWN 1725 75WP (pyridaben)	Foliar – 4 oz	X		
GWN 1725 75WP (pyridaben)	Foliar – 6 oz	Х		
Marathon II 2F (imidacloprid)	Drench - 1.7 fl oz/1000 pots	X		
Marathon II 2F (imidacloprid)	Foliar – 1.5 fl oz	X		
Safari 20SG (dinotefuran)	Foliar – 4 oz	X	X	
Tristar 0.8EC (acetamiprid)	Foliar – 2 fl oz	X	X	
Untreated				

		Population Counts, Means Separations, and Percent Control ^z							
Treatment (Rate)	8/05/05 -3 DAT	8/18/05 10 DAT	8/25/05 17 DAT	8/31/05 23 DAT	9/6/05 29 DAT	9/12/05 35 DAT	9/19/05 42 DAT		
Avid 0.15EC (4 fl oz)	1.3 a	21.7 a (44)	17.8 abc (84)	11.3 c-f (83)	14.8 ab (66)	11.0 a-d (86)	16.8 a (84)		
Flagship 25WG (4 oz)	0.3 a	23.3 a (40)	9.0 ab (92)	21.5 a-e (68)	2.8 a (94)	7.5 a (90)	14.0 a (87)		
Forbid 2SC (2 fl oz)	0.8 a	3.5 a (91)	10.3 a (91)	1.3 abc (98)	4.8 ab (89)	5.8 ab (93)	14.6 a (86)		
Forbid 2SC (4 fl oz)	0.8 a	3.5 a (91)	10.3 a (91)	0.0 a (100)	13.5 ab (69)	14.2 a-d (82)	41.0 a (62)		
GWN 1725 75WP (4 oz)	0.3a	5.7 a (15)	8.3 ab (93)	22.3 ef (66)	26.5 bc (40)	23.7 b-e (69)	25.0 a (77)		
GWN 1725 75WP (6 oz)	0.0 a	1.0a (97)	1.2 a (99)	7.7 b-f (88)	6.5 ab (85)	17.7 a-d (77)	31.8 a (70)		
Marathon II 2F (1.7 fl oz)	0.2 a	4.0 a (90)	4.0 a (96)	4.5 a-e (93)	8.7 ab (80)	10.2 abc (87)	8.0 a (93)		
Marathon II 2F (1.5 fl oz)	0.8 a	7.2 a (82)	5.8 ab (95)	15.0 a-e (77)	6.7 ab (85)	33.2 b-e (57)	16.7 a (84)		
Safari 50WG (4 oz)	0.0 a	4.3 a (89)	4.0 a (96)	0.8 ab (99)	8.0 a (82)	40.7 bcd (48)	26.2 a (76)		
Tristar 0.8EC (2 fl oz)	0.5 a	12.5 a (68)	9.7 ab (91)	4.3 a-d (94)	4.5 ab (90)	150.7 cde (0)	18.2 a (83)		
Untreated	0.5 a	39.0 a (0)	110.7 d (0)	66.2 f (0)	44.0 c (0)	77.7 e (0)	107.3 a (0)		

Table 3. *Efficacy of foliar and drench applications for Greenhouse Whitefly on Marigold 'Queen Sophia', Davis, 2005a.

* Not an IR-4 Experiment: AMT31:G31. Not all products tested included in table. ^z Population counted as number of larvae counted on three leaves.

^x Means within columns followed by the same letter are not significantly different (P=0.05, LSD).

Davis 2005b. In 2005, Davis and Smitley conducted an experiment comparing several systemic insecticides to two contact insecticides. This test was planned for mealybug research but the populations of greenhouse whiteflies (*Trialeurodes vaporariorum*) were robust enough to collect information on efficacy for this pest also (Table 4 - p16; Table 5 - p17). In addition to the two foliar applications for all products, Safari 20SG was drenched at two rates. Whitefly larvae were counted on 3 leaves. All products provided some level of control. Aria, Safari 20SG, Talus and TriStar 30WP provided excellent control at 17 DAT, while efficacy was delayed slightly to 25 DAT. Orthene TTO reduced populations but not as effectively as the other treatments.

Tuesday and (A stine In gradient)	Application Method –	A	oplication D	ates
reatment (Active Ingredient)	Rate per 100 gal	9/30/05	10/14/05	10/18/05
Aria (flonicamid)	Foliar - 60 g	Х	Х	
Aria (flonicamid)	Foliar - 120 g	Х	Х	
Flagship (thiamethoxam)	Foliar - 2 oz	Х	Х	
Flagship (thiamethoxam)	Foliar - 4 oz	Х	Х	
Safari 20SG (dinotefuran)	Foliar - 4 oz	Х	Х	
Safari 20SG (dinotefuran)	Foliar - 8 oz	Х	Х	
Safari 20SG (dinotefuran)	Drench - 12 oz	Х		
Safari 20SG (dinotefuran)	Drench - 24 oz	Х		
Talus (buprofezin)	Foliar - 18 oz	Х	Х	
Tristar 30 WSP (acetamiprid)	Foliar - 112 g	Х	Х	
Tristar 30 WSP (acetamiprid)	Foliar - 224 g	Х	Х	
Orthene TTO (acephate)	Foliar - 8 oz	Х	Х	
Untreated				
Conserve + Floramite (on all plants)	Foliar - $6 \text{ oz} + 4 \text{ oz}$			X

 Table 4. Efficacy of foliar and drench applications for Greenhouse Whitefly Larvae on Marigold

 'Queen Sophia' – Application Rates and Dates, Davis, 2005b.

2000 x 10, 2000 x									
		Population Counts, Means Separations, and Percent Control ^z							
	9/22/09	10/7/05	10/17/05	10/25/05	11/2/05	11/7/05			
Treatment (Rate)	0 DAT	7 DAT	17 DAT	25 DAT	33 DAT	38 DAT			
Aria (60 g)	237.2 a ^y	29.2 a (0)	5.3 abc (97)	1.3 a (99)	1.2 ab (97)	0.5 ab (100)			
Aria (120 g)	169.4 a	11.3 a (21)	13.8 abcd (90)	2.2 a (98)	0.0 a (100)	1.0 ab (99)			
Flagship (2 oz)	261.1 a	29.4 a (0)	43.5 d (80)	12.5 abc (92)	15.0 abcde (63)	6.5 abc (96)			
Flagship (4 oz)	273.1 a	26.2 a (0)	98.5 cd (56)	9.2 abc (94)	17.8 bcde (58)	4.8 bc (97)			
Safari (4 oz)	435.0 a	18.7 a (49)	10.7 a (97)	6.3 abc (98)	6.3 abcd (91)	5.0 abc (98)			
Safari (8 oz)	127.2 a	11.5 a (0)	10.5 abc (90)	3.7 ab (95)	3.8 abc (81)	0.0 a (100)			
Safari (Drench 12 oz)	305.3 a	29.3 a (0)	22.7 bcd (91)	12.2 abc (93)	38.5 cde (19)	6.7 c (96)			
Safari (Drench 24 oz)	256.7 a	24.5 a (0)	10.5 abc (95)	8.7 abc (94)	0.2 a (100)	6.0 bc (96)			
Talus (18 oz)	292.2 a	38.3 a (0)	22.7 abcd (90)	24.7 c (85)	36.0 de (21)	9.3 abc (95)			
Tristar 30 WSP (112 g)	169.2 a	25.8 a (0)	7.0 ab (95)	1.8 a (98)	0.8 a (97)	32.3 abc (69)			
Tristar 30 WSP (224 g)	74.2 a	92.5 a (0)	37.5 bcd (38)	4.7 abc (89)	4.5 abcd (61)	5.7 abc (87)			
Orthene TTO (8 oz)	249.4 a	42.3 a (0)	68.8 cd (66)	22.3 bc (85)	28.7 de (27)	21.0 c (86)			
Untreated	381.1 a	32.3 a (0)	310.0 e (0)	221.0 d (0)	59.7 e (0)	232.8 d (0)			

Table 5. Efficacy of foliar and drench applications for Greenhouse Whiteflies on Marigold 'Queen Sophia', Davis, 2005b.

^z Populations counted as number of larvae on 3 leaves.

^y Means within columns followed by the same letter are not significantly different at p=0.05 (Fishers Protected LSD).

Silverleaf Whitefly B Biotype

In studying *Bemisia tabaci* B biotype, two different methodologies were utilized to assess population levels. The traditional methodology of counting live adults and immatures was used by Oetting, and a new methodology of counting adults which were trapped by a sticky card during plant desiccation was used by Parrella. The treatment lists for both researchers only overlapped with one product – Judo, so a comparison of the two techniques is not feasible. In these experiments, the effective treatments were Acelepryn, Azatin, Distance, Flagship, Judo, Kontos, Safari, Talus and TriStar. BotaniGard, Insecticidal Soap and Naturalis also reduced whitefly populations significantly, but not quite to the same level as their chemical counterparts.

Ludwig 2004. This experiment tested efficacy of four systemic neonicotinoids on whiteflies obtained from a commercial nursery. Treatments were applied on 23 Aug and 7 Sep 2004. All insecticide treatments included 0.05% Thoroughbred (non-ionic organosilicone). Flagship, Tristar, and Safari treatments reduced whitefly nymph populations 14, 22, and 26 DAT (Table). The numbers of nymphs in the Marathon II treatment was not different from the other insecticide treatments on all sample periods, and statistically lower than the control at 22 and 28 DAT. Nymph populations were similar among all chemical treatments on all dates. Tristar resulted in a lower numbers of pupae at 22 DAT. Populations of pupae on plants treated with Flagship, Safari and Tristar were significantly lower than those on control plants at 28 DAT. Pupae populations were similar among all chemical treatments on all dates.

	Doto Dor	Population Counts, Means Separations, and Henderson's Percent Control ^z						
Treatment (Rate)	100 Gal	0 DAT 11/1	7 DAT 11/8	14 DAT 11/15	22 DAT 11/22	28 DAT 11/29		
			Nymphs					
Flagship 25WP	2 oz	118.3 a	51.8 a (46)	9.8 b (80)	6.8 b (73)	1.3 b (97)		
Marathon II 2F	1.7 fl oz	145.3 a	68.5 a (42)	35.0 ab (42)	9.0 b (70)	11.3 b (77)		
Safari 20SG	8 oz	221.0 a	77.3 a (57)	24.5 b (73)	2.5 b (95)	3.0 b (96)		
Tristar 70WP	1.7 oz	241.3 a	24.3 a (92)	4.5 b (95)	2.8 b (94)	1.8 b (98)		
Untreated	-	138.5 a	112.0 a (0)	57.3 a (0)	29.0 a (0)	46.8 a (0)		
		-	Pupae			-		
Flagship 25WP	2 oz	0 a	20.8 a	57.0 a	8.3 ab	4.3 b		
Marathon II 2F	1.7 fl oz	0 a	11.8 a	28.3 a	13.5 ab	10.3 ab		
Safari 20SG	8 oz	0 a	35.3 a	79.8 a	17.3 ab	3.0 b		
Tristar 70WP	1.7 oz	0 a	54.3 a	46.8 a	5.8 b	2.3 b		
Untreated	-	0 a	8.3 a	56.3 a	26.0 a	14.5 a		

 Table 6. * Residual efficacy of neonicotinoid foliar applications for uncaged Bemisia B Biotype

 Whiteflies on Lantana, Ludwig, 2004.

* Not an IR-4 Experiment: AMT31:G29.

^z Population counted on five leaves.

^x Means within columns followed by the same letter are not significantly different (P<0.05, LSD).

Ludwig and McKenzie 2005a. This experiment tested 6 products as foliar residues at three different timings on Poinsettia 'Freedom Red'. Adults were placed in clip cages on treated leaves, and adult mortality assessed 48 hours after initial exposure. In addition to assessing initial adult mortality, treatments were followed through to the next generation to determine the percent of eggs not producing adults after exposure to the product residues (Table 7 - p19). The adult mortality was limited once sprays had dried, but the impact on the subsequent generations varied significantly among treatments. Distance completely broke the life cycle with exposure to residues at all 3 timings. Avid provided 100% control with residues up to 7 - 55 hours after application, but control declined at 8-10 days and 14-16 days. Judo 4F exhibited excellent control initially which also declined slightly over time.

Broduct (Bots nor 100 col)	Impact after Exposure to Insecticide Residues							
Product (Kate per 100 gal)	7 - 55 hours 8-10 day		14-16 days					
Adult Mortality and Adjusted Percent Control								
Avid 0.15EC (8 fl oz)	68.6 a (65%)	14.6 (10%)	5.5 (0%)					
Distance IGR (8 fl oz)	21.3 c (13%)	10.9 (6%)	1.4 (0%)					
Enstar II (10 fl oz)	55.5 ab (51%)	9.1 (4%)	9.1 (1%)					
Endeavor 50WG (5 oz)	10.6 c (2%)	7.9 (3%)	15.0 (8%)					
Judo (4 fl oz)	31.0 bc (24%)	11.4 (6%)	6.8 (0%)					
Sanmite 75WP (6 oz)	31.6 bc (25%)	25.8 (21%)	7.9 (0%)					
Untreated Control	9.1 c (0%)	5.5 (0%)	7.9 (0%)					
Percent Eggs 1	Failing to Produce Adult	s after Exposure to Resi	dues					
Avid 0.15EC (8 fl oz)	100.0 a	95.5 ab	55.4 bc					
Distance IGR (8 fl oz)	100.0 a	100.0 a	100.0 a					
Enstar II (10 fl oz)	81.6 b	36.5 d	31.1 cd					
Endeavor 50WG (5 oz)	24.3 с	49.5 cd	26.6 d					
Judo (4 fl oz)	99.1 a	94.0 b	82.6 b					
Sanmite 75WP (6 oz)	73.4 b	60.8 c	73.0 b					
Untreated Control	35.9 c	28.7 d	9.6 d					

Table 7. Residual efficacy of foliar applications for immature Bemisia B Biotype Whiteflies clipcaged onto Poinsettia 'Freedom Red', Ludwig and McKenzie, 2005a.

Means within a column followed by different letters are significantly different (P<0.05, LSD). Statistical analysis not conducted on second two columns due to low adult mortality rates.

Ludwig and McKenzie 2005b. This experiment tested 5 systemic neonicotinoids at four different timings on Poinsettia 'Freedom Red'. Adults were placed in clip cages on treated leaves, and adult mortality assessed 48 hours after initial exposure (Table 8- p19). At the first assessment period (7 to 55 hours), Celero, Flagship, Marathon, Safari and TriStar provided statistically significant mortality and percent control versus the untreated populations. By 11 to 13 days after treatment, the level of control varied among the applications. Celero and the 4 oz rate of Flagship did not provide acceptable mortality. The 6 oz rate of Flagship, Marathon and Safari demonstrated good control, whereas TriStar continued to show 100% mortality. By 22 to 24 days after treatment, the residual control had declined dramatically.

 Table 8. Residual efficacy of neonicotinoid foliar applications for adult Bemisia B Biotype

 Whiteflies clip-caged onto Poinsettia 'Freedom Red', Ludwig and McKenzie, 2005b.

	Adult Mortality and Adjusted Percent Control after Exposure to Insecticide						
		Resid	ues				
Product (Rate per 100 gal)	7-55 hrs	11-13 days	22-24 days	39-41 days			
Celero (4 oz)	93.6 a (90%)	37.8 bc (33%)	18.8 c (3%)	5.0 ab (0%)			
Flagship (4 oz)	93.0 a (90%)	37.2 bc (32%)	19.8 c (4%)	0.0 b (0%)			
Flagship (6 oz)	100.0 a (100%)	84.8 a (84%)	30.7 bc (17%)	7.5 ab (0%)			
Marathon II (1.7 fl oz)	98.3 a (97%)	89.0 a (88%)	68.8 ab (63%)	9.3 ab (1%)			
Safari (8 oz)	100.0 a (100%)	77.8 ab (76%)	13.3 c (0%)	3.2 b (0%)			
TriStar 30SG (5.3 oz)	100.0 a (100%)	100.0 a (100%)	87.1 a (85%)	25.4 a (19%)			
Untreated	33.1 b (0%)	7.7 c (0%)	16.5 c (0%)	8.0 ab (0%)			

Means within a column followed by different letters are significantly different (P<0.05, LSD).

Ludwig and McKenzie 2005c. This experiment tested 4 neonicotinoid drenches at four different timings on Poinsettia 'Freedom Red' fully expanded (old) leaves and newly emerged terminal (new) leaves. Adults were placed in clip cages on treated leaves, and adult mortality assessed 48 hours after initial exposure (Table 9 - p20). Within 48 hours, Safari provided good control on both old and new leaves, while Celero, Flagship and Marathon had little impact. At the 11 to 13 day ratings, Flagship Marathon, and Safari completely controlled adult whiteflies on older leaves and provided excellent control on new leaves. When adults were placed onto leaves at the 22 to 24 day rating, Marathon and Safari continued to provide excellent control on old leaves, but efficacy with these and all other treatments started to decline on newly emerged leaves. By the 39 to 41 days challenge, only Marathon had an adult mortality statistically higher than the untreated for old leaves, but it would not be considered commercially acceptable. While not statistically different, Flagship drenched at the higher volume per pot provided higher mortality starting at the second rating period.

Table 9. Residual efficacy of neonicotinoid drench applications for adult Bemisia B Biotype					
Whiteflies clip-caged onto Poinsettia 'Freedom Red', Ludwig and McKenzie, 2005c.					
Product (Rate per 100 gal @	Adult Mortality and Adjusted Percent Control after Exposure to				

Due duet (Dete new 100 cel @	Adult Mortanty and Adjusted Fercent Control after Exposure to							
Product (Kate per 100 gai @	Insecticide Residues							
volume per pot)	0-48 hrs 11-13 days 22-24 day		22-24 days	39-41 days				
Fully Expanded Leaves								
Celero (4 oz @ 3 oz)	8.8 b (0%)	87.8 b (87%)	70.7 ab (67%)	10.4 b (7%)				
Flagship (4 oz @ 2 oz)	13.3 b (1%)	96.3 ab (96%)	56.5 b (51%)	12.0 b (9%)				
Flagship (4 oz @ 3 oz)	11.8 b (0%)	100.0 a (100%)	81.6 ab (79%)	15.0 b (12%)				
Marathon II (1.7 fl oz @ 3 oz)	14.5 b (3%)	100.0 a (100%)	98.3 a (98%)	48.1 a (46%)				
Safari (24 oz @ 4 oz)	90.0 a (89%)	100.0 a (100%)	98.3 a (98%)	15.2 b (12%)				
Untreated	12.2 b (0%)	6.7 c (0%)	11.4 c (0%)	3.8 b (0%)				
	Newly Emerged	Terminal Leaves						
Celero (4 oz @ 3 oz)	16.7 b (0%)	71.5 a (69%)	62.3 ab (52%)	53.6 a (36%)				
Flagship (4 oz @ 2 oz)	19.4 b (3%)	93.3 a (93%)	83.7 a (79%)	47.3 a (28%)				
Flagship (4 oz @ 3 oz)	9.8 b (0%)	97.9 a (98%)	92.0 a (90%)	48.3 a (29%)				
Marathon II (1.7 fl oz @ 3 oz)	14.6 b (0%)	98.3 a (98%)	88.7 a (86%)	47.3 a (28%)				
Safari (24 oz @ 4 oz)	80.7 a (77%)	100.0 a (100%)	56.2 ab (45%)	35.8 a (12%)				
Untreated	16.7 b (0%)	8.3 b (0%)	20.8 b (0%)	27.2 a (0%)				

Means within a column followed by different letters are significantly different (P<0.05, LSD).

Parrella 2006. During 2007, Parrella conducted two simultaneous experiments examining efficacy for *Bemisia tabaci* B biotype. All plants in each experiment were caged and treated at the first application date, but only the first experiment received the second application. For both experiments, treated plants were placed into brown paper bags with a blue sticky card. After desiccation, the number of adult whiteflies was counted on each sticky card. In the first experiment (Table 10 - p21; Table 11 - p21), good to excellent control was achieved with Acelepryn (formerly DPX-E2Y45), Judo, Talus and TriStar. By the second reading date, fair to good control was also observed with Aria and Pedestal. In the second experiment, no treatment was significantly different than the water control, although Judo, Talus, and TriStar did reduce the average population per sticky card to less than 1.

		Application Dates			
Treatment (Active Ingredient)	Application Method – Rate per 100 gal	9/7/07 Experiment 1 Experiment 2	9/21/07 Experiment 1 		
Acelepryn (chloranitriprole)	Foliar – 19 oz	Х	Х		
Agri-50	Foliar – 53 oz	Х	Х		
Aria (flonicamid)	Foliar – 122 g	Х	Х		
BotaniGard (Beauveria bassiana)	Foliar – 284 g	Х	Х		
Ecotrol	Foliar – 10 oz	Х	Х		
Endeavor (pymetrozine)	Foliar – 284 g	Х	Х		
Judo (spiromesifen)	Foliar – 4 oz	Х	Х		
Pedestal (novaluron)	Foliar – 8 oz	Х	Х		
Talus (buprofezin)	Foliar – 9 oz	Х	Х		
TriStar (acetamiprid)	Foliar – 96 g	Х	Х		
Water-treated (H ₂ O)	Foliar	X	X		
Untreated					

 Table 10. Efficacy of foliar applications for adult caged Bemisia B Biotype Whiteflies on Poinsettia

 'Prestige' – Application Rates and Dates, Parrella, 2006.

Table 11. Effi	cacy of foliai	applications f	for adult	caged Bemisia	B Biotype	Whiteflies ^z	on Poinsettia
'Prestige', Pai	rella, 2006.						

	Population Counts, Means Separations, and Percent Control y					
	Experi	ment 1	Experiment 2			
Treatment (Active Ingredient)	10 DAT 9/17/07	26 DAT 10/3/07	10 DAT 9/17/07			
Acelepryn (chloranitriprole)	4.0 ab (81) ^x	3.8 a (86)	8.0 ab (0)			
Agri-50	6.9 abc (67)	10.3 abcd (61)	4.8 ab (10)			
Aria (flonicamid)	13.1 abc (37)	6.5 abc (75)	5.1 ab (2)			
BotaniGard (Beauveria						
bassiana)	6.5 abc (69)	11.9 abcd (54)	14.5 b (0)			
Ecotrol	10.9 abc (48)	20.3 bcd (22)	10.1 ab (0)			
Endeavor (pymetrozine)	20.0 bc (4)	9.0 abc (66)	5.6 ab (0)			
Judo (spiromesifen)	1.0 a (95)	3.3 a (88)	0.3 a (95)			
Pedestal (novaluron)	13.8 abc (34)	4.4 ab (83)	9.3 ab (0)			
Talus (buprofezin)	0.3 a (99)	5.3 abc (80)	0.4 a (93)			
TriStar (acetamiprid)	0.9 a (96)	1.4 a (95)	0.8 a (86)			
Water-treated (H ₂ O)	13.1 abc (37)	21.0 cd (20)	8.3 ab (0)			
Untreated	20.9 c (0)	26.1 d (0)	5.3 ab (0)			

 z At the start of the experiment, B was 100% of the population.

^y Populations counted as number of adults on 1 blue sticky card after plant dried in brown paper bag for 4 weeks.

^x Means within columns followed by the same letter are not significantly different at p=0.0001 (Tukey-Kramer HSD).

Oetting 2007. During 2007, Oetting tested several biopesticides for their activity against *Bemisia tabaci* B biotype (**Table 12** - p22). While Judo (spiromesifen) provided excellent control, BotaniGard at 32 oz per 100 gal exhibited good management of immature whitefly. None of the other products demonstrated acceptable levels of control (**Table 13** - p22). It is interesting to note that Naturalis was the only product

providing greater than 90% control of adult whiteflies; this efficacy did drop off after treatments were discontinued. A similar pattern was observed for Met52 at the 15 fl oz rate, although levels of efficacy were only about 80%. None of the treatments caused phytotoxicity, but NoFly left unacceptable residues and Bug Oil made the leaves shiny. Parasitoids moved into the trial on November 8 and were in all treatments by November 15th.

 Table 12. Efficacy of foliar applications for uncaged Bemisia B Biotype Whiteflies on Poinsettia

 'Prestige Red' – Application Rates and Dates, Oetting, 2007.

Treatment (Active Ingredient)	Application Method –	Application Dates					
Treatment (Active Ingredient)	Rate / 100 gal	11/1	11/5	11/8	11/13	11/15	
BotaniGard (Beauveria bassiana)	Foliar - 32oz	Х	Х	Х	Х		
Bug Oil	Foliar - 1gal	Х		Х		Х	
Judo 4SC (spiromesifen)	Foliar - 4oz	Х				Х	
Met 52 (Metarhizium anisopliae F52)	Foliar - 15oz	Х	Х	Х	Х		
Met 52 (Metarhizium anisopliae F52)	Foliar - 30oz	Х		Х		Х	
Naturalis (Beauveria bassiana)	Foliar - 64oz	Х	Х	Х	Х		
NoFly (Paecilomyces fumosoroseus S97)	Foliar - 50oz	Х	Х	Х	Х		
NoFly (Paecilomyces fumosoroseus S97)	Foliar - 100oz	X		Х		X	
Control							

 Table 13. Efficacy of foliar applications for uncaged Bemisia B Biotype Whiteflies on Poinsettia

 'Prestige Red', Oetting, 2007.

	Pop	Population Counts, Means Separations, and Henderson's Percent Control ^z							
Treatment (Rate)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT			
	11/1	11/8	11/15	11/22	11/29	12/6			
			Immatures						
BotaniGard (32 oz)	25.8 ab ^y	11.8 cd (64)	11.6 d (68)	6.1 d (90)	14.1 de (85)	22.1 ef (83)			
Bug Oil	11.7 b	13.1 cd (13)	14.6 cd (12)	9.2 cd (68)	46.3 cde (0)	74.8 cde (0)			
Judo 4SC	15.8 b	7.3 d (64)	8.4 d (63)	2.1 d (95)	3.8 e (93)	2.2 f (97)			
Met 52 (15 fl oz)	15.3 b	29.8 ab (0)	20.7 cd (5)	35.6 bc (6)	41.7 cde (23)	68.0 de (11)			
Met 52 (30 fl oz)	21.3 ab	28.1 abc (0)	26.9 bc (11)	42.6 b (19)	49.4 cde (34)	81.3 cd (23)			
Naturalis (64 oz)	25.1 ab	14.2 bcd (56)	16.4 cd (54)	34.4 bc (45)	55.4 cd (38)	76.3 cde (39)			
NoFly (50 oz)	14.2 b	9.8 d (46)	12.6 cd (38)	28.8 bcd (18)	79.3 bc (0)	123.9 bc (0)			
NoFly (100 oz)	25.0 ab	23.6 bcd (26)	37.9 ab (0)	53.1 b (14)	157.8 a (0)	202.9 a (0)			
Check	33.3 a	42.7 a (0)	47.4 a (0)	82.3 a (0)	117.9 ab (0)	165.6 ab (0)			
			Adults						
BotaniGard (32 oz)	13.6 a	3.2 c (77)	1.6 bcd (72)	1.7 b (70)	6.8 b (0)	6.0 b (0)			
Bug Oil	9.4 a	5.4 bc (45)	3.4 bc (15)	1.3 b (67)	2.9 bc (0)	4.4 b (0)			
Judo 4SC	12.7 a	6.4 bc (51)	2.4 bcd (56)	1.3 b (75)	1.4 c (20)	1.6 b (20)			
Met 52 (15 fl oz)	15.0 a	2.6 c (83)	1.2 cd (81)	2.3 b (63)	4.6 bc (0)	7.9 b (0)			
Met 52 (30 fl oz)	16.7 a	5.8 bc (66)	4.2 b (41)	2.7 b (61)	4.1 bc (0)	1.6 b (39)			
Naturalis (64 oz)	17.9 a	1.3 c (93)	0.6 d (92)	1.4 b (81)	2.4 bc (3)	4.4 b (0)			
NoFly (50 oz)	20.8 a	6.6 bc (69)	2.2 bcd (75)	2.9 b (66)	3.9 bc (0)	6.1 b (0)			
NoFly (100 oz)	20.7 a	10.1 b (53)	3.3 bc (63)	1.6 b (81)	12.8 a (0)	21.7 a (0)			
Check	16.6 a	17.2 a (0)	7.1 a (0)	6.9 a (0)	2.3 bc (0)	2.6 b (0)			

^z Population counted on three leaves.

^y All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Oetting 2008. During 2008, Oetting repeated the research looking at three biopesticides for *Bemisia tabaci* B biotype efficacy (Table 14 - p23). All of the insecticides were successful in reducing the population of immature whiteflies significantly below the water check by the end of the trial. However, none of them were successful in reducing the population sufficiently to meet grower standards (Table 15 - p23). There was a low population of adults throughout the trial, and there was very little biological significant difference among the treatments.

Table 14. *Efficacy of foliar applications for uncaged Bemisia B Biotype Whiteflies on Poinsetti
'Independence Red' – Application Rates and Dates, Oetting, 2008e.

Treatment (Active Incredient)	Application Method –	Application Dates				
reatment (Active ingredient)	Rate / 1 Liter	9/29	10/2	10/6	10/13	
Botanigard (Beauveria bassiana)	Foliar – 5 ml	Х	Х	Х		
Botanigard (Beauveria bassiana)	Foliar – 5 ml	Х		Х	Х	
Met 52 (Metarhizium anisopliae Strain F52)	Foliar – 1.7 ml	Х	Х	Х		
Met 52 (Metarhizium anisopliae Strain F52)	Foliar – 1.7 ml	Х		Х	Х	
NoFly (Paecilomyces fumosoroseus)	Foliar – 2 g	Х	Х	Х		
NoFly (Paecilomyces fumosoroseus)	Foliar – 2 g	Х		Х	Х	
NoFly (Paecilomyces fumosoroseus)	Foliar – 4 g	Х		Х	Х	
Control						

Table 15. *Efficacy of foliar applications for uncaged Bemisia B Biotype Whiteflies on Poinsettia 'Independence Red', Oetting, 2008e.

	Population Counts, Means Separations, and Henderson's Percent Control ^z								
Treatment (Rate)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT			
	11/1	11/8	11/15	11/22	11/29	12/6			
Immatures									
Botanigard (5 ml 3-4 d)	32.1 b	15.1 c (35)	8.3 c (37)	8.3 cd (33)	10.1 abc (0)	20.0 b (0)			
Botanigard (5 ml 7 d)	45.7 ab	34.4 ab (0)	17.9 abc (5)	15.0 bcd (15)	7.4 abc (34)	15.2 b (43)			
Met 52 (1.7 ml 3-4 d)	36.0 b	19.4 bc (26)	9.9 bc (33)	6.8 d (51)	4.8 c (46)	12.1 b (42)			
Met 52 (1.7 ml 7 d)	36.7 b	22.8 bc (15)	11.7 bc (23)	9.7 cd (32)	6.8 bc (25)	11.5 b (46)			
NoFly (2 g ml 3-4 d)	45.1 ab	29.2 abc (11)	20.8 ab (0)	16.1 abc (8)	15.5 ab (0)	22.0 b (16)			
NoFly (2 g ml 7 d)	51.9 ab	30.1 abc (20)	21.6 ab (0)	21.4 ab (0)	16.5 a (0)	15.2 b (50)			
NoFly (4 g ml 7 d)	35.9 b	16.2 c (38)	11.8 bc (20)	12.0 cd (14)	13.7 abc (0)	12.4 b (41)			
Check	63.2 a	46.0 a (0)	26.0 a (0)	24.5 a (0)	15.6 ab (0)	36.7 a (0)			
			Adults						
Botanigard (5 ml 3-4 d)	1.7 a	1.2 a (87)	1.4 b (79)	2.0 b (88)	2.8 a (79)	1.1 a (93)			
Botanigard (5 ml 7 d)	0.7 a	4.1 a (0)	6.2 a (0)	3.1 ab (56)	2.4 a (57)	2.1 a (66)			
Met 52 (1.7 ml 3-4 d)	1.0 a	1.4 a (73)	1.5 b (63)	3.1 ab (69)	1.9 a (76)	1.8 a (79)			
Met 52 (1.7 ml 7 d)	1.1 a	1.3 a (77)	1.3 b (70)	1.2 b (89)	1.6 a (82)	3.4 a (65)			
NoFly (2 g ml 3-4 d)	0.8 a	1.0 a (76)	3.7 ab (0)	6.5 a (19)	5.0 a (22)	1.7 a (76)			
NoFly (2 g ml 7 d)	0.6 a	1.2 a (62)	2.8 ab (0)	2.7 ab (55)	3.2 a (33)	1.5 a (71)			
NoFly (4 g ml 7 d)	1.0 a	0.9 a (83)	1.2 b (70)	1.3 b (87)	1.9 a (76)	2.6 a (70)			
Check	0.4 a	2.1 a (0)	1.6 b (0)	4.0 ab (0)	3.2 a (0)	3.5 a (0)			

^z Population counted on three leaves.

^y All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Davis 2008. In 2008, Davis and Smitley conducted an experiment comparing efficacy of several insecticides applied foliar or drench against *Bemisia tabaci* B biotype (Table 16). Foliar treatments were applied to runoff 23 Sep and repeated on 7 Oct. The drench treatments were applied by pouring 200 ml of insecticide-water mixture into each 6-inch pot on 23 Sep. Whitefly larvae and pupae were counted on 5 leaves.

The first instar larvae (Table 17) that were found were very difficult to assess whether they were alive or had merely hatched and died shortly after settling down. The results on larger larvae and pupae on and after the 7 Oct sample are more indicative of the effectiveness of the treatments. All treatments were significantly different from the untreated check during the 7 Oct, 14 Oct, 21 Oct and 4 Nov samples with the exception of the Merit drench, which was not significantly different until after 7 Oct.

Table 16. *Efficacy of foliar and drench applications for uncaged Bemisia B Biotype Whiteflies on Marigold 'Yellow Boy' – Application Rates and Dates, Davis, 2008.

Tuestment (Astive Incuedient)	Application Method –	Application Dates		
(Active ingredient)	Rate per 100 gal	9/23	10/07	
BYI 08330 SC (spirotetramat)	Drench - 0.38 fl oz	Х		
BYI 08330 SC (spirotetramat)	Drench - 0.64 fl oz	Х		
BYI 08330 SC (spirotetramat)	Drench - 0.96 fl oz	Х		
BYI 08330 SC (spirotetramat)	Drench – 1.28 fl oz	Х		
BYI 08330 SC (spirotetramat)	Foliar - 1.7 fl oz	Х	Х	
BYI 08330 SC (spirotetramat)	Foliar – 2.5 fl oz	Х	Х	
Meridian 25 WG (thiamethoxan)	Foliar – 1 oz	Х	Х	
Meridian 25 WG (thiamethoxam)	Foliar – 2 oz	Х	Х	
Merit 75 WP (imidacloprid)	Drench – 2.1 oz	Х		
Merit 75 WP (imidacloprid)	Foliar – 0.5 oz	Х	Х	
Safari 20SG (dinotefuran)	Drench – 2.8 oz	Х		
Tristar 70 WSP (acetamiprid)	Foliar – 2.3 oz	Х	X	
Untreated	-			

	Population Counts, Means Separations, and Percent Control ^z								
	9/23	9/30	10/07	10/14	10/21	11/04			
Treatment (Rate per 100 Gal)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	42 DAT			
First Instar Larvae									
BYI 08330 (Drench - 0.38 fl oz)	9.3 a	4.3 a	0.7 ab	1.0 a	0.2 a	0.6 a			
BYI 08330 (Drench - 0.64 fl oz)	9.7 a	6.2 ab	0.2 a	1.7 a	0.3 a	0.0 a			
BYI 08330 (Drench - 0.96 fl oz)	9.2 a	5.3 ab	4.5 d	2.3 a	1.7 a	1.2 a			
BYI 08330 (Drench - 1.28 fl oz)	9.3 a	16.0 c	2.5 cd	1.7 a	0.0 a	0.0 a			
BYI 08330 SC (1.7 fl oz)	9.5 a	13.2 bc	2.3 bcd	1.3 a	0.2 a	2.2 a			
BYI 08330 SC (2.5 fl oz)	8.5 a	5.3 ab	0.8 abc	0.2 a	0.3 a	0.2 a			
Meridian 25 WG (1 oz)	9.7 a	2.7 a	0.5 ab	0.5 a	0.0 a	0.2 a			
Meridian 25 WG (2 oz)	7.8 a	4.0 a	0.2 a	0.5 a	0.0 a	0.0 a			
Merit (Drench - 2.1 oz)	7.8 a	3.2 a	0.5 ab	0.2 a	0.0 a	0.0 a			
Merit 75 WP (0.5 oz)	8.7 a	1.8 a	0.8 abc	0.2 a	0.0 a	0.2 a			
Safari (Drench - 2.8 oz)	8.8 a	3.0 a	0.8 abc	0.5 a	0.2 a	0.3 a			
Tristar 70 WSP (2.3 oz)	10.2 a	0.8 a	0.0 a	0.0 a	0.2 a	0.0 a			
Untreated	10.0 a	7.5 ab	0.3 a	2.2 a	0.3 a	0.0 a			
	Larg	e Larvae	and Pupae	-	-				
BYI 08330 SC (Drench - 0.38 fl oz)	-	-	0.2 a (96)	0.2 a (96)	0.0 a (100)	0.8 a (92)			
BYI 08330 SC (Drench - 0.64 fl oz)	-	-	0.0 a (100)	0.0 a (100)	0.0 a (100)	0.0 a (100)			
BYI 08330 SC (Drench - 0.96 fl oz)	-	-	0.0 a (100)	0.0 a (100)	0.0 a (100)	0.0 a (100)			
BYI 08330 SC (Drench - 1.28 fl oz)	-	-	0.0 a (100)	0.3 ab (95)	0.0 a (100)	0.2 a (98)			
BYI 08330 SC (1.7 fl oz)	-	-	0.0 a (100)	0.0 a (100)	0.2 a (96)	0.5 a (95)			
BYI 08330 SC (2.5 fl oz)	-	-	1.7 ab (62)	0.0 a (100)	0.0 a (100)	0.0 a (100)			
Meridian 25 WG (1 oz)	-	-	0.8 ab (82)	2.2 b (60)	1.8 b (67)	0.7 a (93)			
Meridian 25 WG (2 oz)	-	-	1.5 ab (67)	1.0 ab (82)	0.0 a (100)	1.8 a (82)			
Merit 75 WP (Drench - 2.1 oz)	-	-	3.2 bc (29)	0.7 ab (87)	0.2 a (96)	1.3 a (87)			
Merit 75 WP (0.5 oz)	-	-	0.2 a (96)	1.0 ab (82)	0.0 a (100)	1.8 a (82)			
Safari 20SG (Drench - 2.8 oz)	-	-	0.5 a (89)	0.0 a (100)	0.0 a (100)	0.0 a (100)			
Tristar 70 WSP (2.3 oz)	-	-	0.0 a (100)	0.0 a (100)	0.0 a (100)	0.0 a (100)			
Untreated	-	-	4.5 c (0)	5.5 c (0)	5.5 c (0)	9.8 b (0)			

Table 17. *Efficacy of foliar and drench applications for uncaged Bemisia B Biotype Whiteflies on Marigold 'Yellow Boy', Davis, 2008.

* Not an IR-4 Experiment: AMT34:G35.

^z Populations counted as number of whiteflies on 5 leaves.

^y Means within columns followed by the same letter are not significantly different at p=0.05 (Fishers LSD).

Gu 2008. During 2008, Gu tested several products for their activity against *Bemisia tabaci* B biotype (Table 18). All products were applied as foliar sprays except Safari which was applied drench once on April 18; foliar sprays were applied twice starting 4/18 at 2-week intervals except Azatin which was applied 5 times weekly. Pre-treatment counts averaged 3.0 immatures per two leaves. Safari, applied either as a soil drench or as two foliar sprays, and Distance gave best overall control of whiteflies; Azatin and Judo gave acceptable control (Table 19).

Treatment (Active Incredient)	Application Method –	Application Dates						
Treatment (Active Ingredient)	Rate per 100 gal	4/18	4/25	5/2	5/9	5/16		
Azatin XL (azadirachtin)	Foliar – 16 fl oz	Х	Х	Х	Х	Х		
Distance 0.86EC (pyriproxifen)	Foliar – 8 fl oz	Х		Х				
Flagship 25WG (thiamethoxam)	Foliar – 4 oz	Х		Х				
Judo 4F (spiromesifen)	Foliar – 4 fl oz	Х		Х				
Safari 20SG (dinotefuran)	Drench – 24 oz	Х						
Safari 20SG (dinotefuran)	Foliar – 8 oz	Х		Х				
Talus 40SC (buprofezin)	Foliar - 9 fl oz	Х		Х				
Unsprayed Control								

 Table 18. *Efficacy of foliar applications for immature uncaged Bemisia B Biotype Whiteflies on

 Poinsettia 'Freedom Red' – Application Rates and Dates, Gu, 2008.

Table 19. *Efficacy of foliar applications for immature uncaged Bemisia B Biotype Whiteflies on Poinsettia 'Freedom Red', Gu, 2008.

Treatment (Active Ingredient)	Population Counts, Means Separations, and Percent Control ^y						
Treatment (Active Ingredient)	14 DAT 5/2	28 DAT 5/16	42 DAT 5/30				
Azatin XL (azadirachtin)	16.8 b (96)	0.0 b (100)	19.7 bc (92)				
Distance 0.86EC (pyriproxifen)	13.8 bc (97)	1.3 b (91)	0.0 e (100)				
Flagship 25WG (thiamethoxam)	4.0 bc (99)	1.0 b (93)	90.3 abc (63)				
Judo 4F (spiromesifen)	18.5 b (95)	0.3 b (98)	18.0 cd (93)				
Safari 20SG (dinotefuran) drench	1.8 bc (100)	0.0 b (100)	0.0 e (100)				
Safari 20SG (dinotefuran)	0.5 c (100)	0.0 b (100)	4.3 de (98)				
Talus 40SC (buprofezin)	5.5 bc (99)	0.3 b (98)	145.3 ab (40)				
Unsprayed Control	407.0 a (0)	14.2 a (0)	242.5 a (0)				

* Not an IR-4 Experiment: AMT34:G39.

^y Immatures counted on two leaves.

^x Means within columns followed by the same letter are not significantly different at p=0.01 (Tukey's HSD).

Gu 2008. During 2008, Gu tested several products recommended for homeowner use for their activity against *Bemisia tabaci* B biotype (Table 20). All products were applied as foliar sprays applied twice starting May 2 at 2- or 3-week intervals. Pre-treatment counts averaged 407 immatures per two leaves. At 20 DAT and 30 DAT all treatments significantly reduced whitefly numbers relative to the untreated check, with Ortho Volck Oil providing best overall control. The large no. of immature whiteflies in the Azatin treatment at 10 DAT1 was due to an accumulation of newly settled crawlers. Safer Insect Killing Soap caused significant phytotoxicity on some plants with symptoms including tip burn, and bronzing and yellowing of leaves.

T ()	Rate per		Population Counts, Means Separations, and Percent Control ^y				
l reatment	100 gal	Application Dates	10 DAT 5/12	20 DAT 5/22	30 DAT 6/1		
Azatin XL (azadirachtin)	16 fl oz	May 2, 9,16	524.8 a (0)	33.2 b (94)	15.6 c (98)		
Ortho Volck Oil Spray 97% EC (petroleum oil)	250 fl oz	May 2, 16	13.8 b (92)	0.2 c (100)	1.6 d (100)		
Fertilome Triple Action Plus 70% EC (neem oil/pyrethrins/piperonyl butoxide)	100 fl oz	May 2, 9, 16	32.6 ab (82)	5.4 bc (99)	39.6 bc (96)		
Safer Insect Killing Soap 50%LC (insecticidal soap)	250 fl oz	May 2, 9, 16	2.4 b (99)	8.0 bc (98)	157.8 b (84)		
Unsprayed Control			179.2 a (0)	527.4 a (0)	969.6 a (0)		

 Table 20. *Efficacy of foliar applications for immature uncaged Bemisia B Biotype Whiteflies on

 Poinsettia 'Freedom Red', Gu, 2008.

* Not an IR-4 Experiment: AMT34:G39.

^y Immatures counted on two leaves.

^x Means within columns followed by the same letter are not significantly different at p=0.01 (Tukey's HSD).

Frank, 2012. During 2012, Frank tested several products applied as foliar sprays for their activity against *Bemisia tabaci* B biotype on poinsettia (**Table 21**). Abundance of whitefly eggs and nymphs was significantly less than untreated controls in all insecticide treatments by 19 days after initial treatment on October 31 (**Table 22**). Flagship, GF-2626, GF-2860, NNI-0101 provided the best overall control Some phytotoxicity was noticed in Ultra Pure Oil plants but not in any other treatments.

Treastreamt (A stine In gradient)	Data / 100 cal		Application Dates					
I reatment (Active Ingredient)	Kate / 100 gai	Rate / 100 gal 10/31 11/7 11/14 11/21		11/28				
Flagship (thiamethoxam)	8.5 oz	Х			Х			
GF-2626 (sulfoxaflor)	5.5 fl oz	Х		Х		Х		
GF-2626 (sulfoxaflor)	11 fl oz	Х		Х		Х		
GF-2860 (spinoteram + sulfoxaflor)	3.5 oz	Х		Х		Х		
GF-2860 (spinoteram + sulfoxaflor)	7 oz	Х		Х		Х		
MB1-203 (<i>Chromobacterium subtsugae</i> strain PRAA4-1T)	2 lb	X	Х		Х			
MB1-203 (<i>Chromobacterium subtsugae</i> strain PRAA4-1T)	4 lb	X	Х		Х			
MB1-206 (Burkholderia sp. strain A396)	2 gal	Х	Х		Х			
NN1-0101 (pyrifluquinazon)	3.2 fl oz	Х		Х		Х		
NN1-0101(pyrifluquinazon)	6.4 fl oz	Х		Х		Х		
No Fly (Paecilomyces fumosoroseus S97)	16 oz	Х		Х		Х		
Preferal (Isaria fumosoroseus)	14 oz	Х		Х		Х		
Preferal (Isaria fumosoroseus)	28 oz	Х		Х		Х		
Ultra Pure Oil (Petroleum Oil)	1 gal	X		X		Х		
Untreated								

 Table 21. Efficacy of foliar applications for immature uncaged Bemisia B Biotype Whiteflies on

 Poinsettia 'Saturnis' – Application Rates and Dates, Frank, 2012.

T	Population Counts, Means Separations, and Henderson's Percent Control ^z					Control ^z
Treatment (Rate)	0 DAT	5 DAT	12 DAT	19 DAT	26 DAT	33 DAT
			Immatures			
Flagship (8.5 oz)	43.7 a	67.5 a (0)	41.3 a (43)	8 e (97)	10.8 e (97)	3.8 d (99)
GF-2626 (5.5 fl oz)	72 a	31.2 a (61)	12.5 a (89)	36.8 de (92)	27.3 de (96)	15.2 d (97)
GF-2626 (11 fl oz)	46.5 a	10.5 a (80)	10 a (87)	21 de (93)	24 e (95)	22.7 d (93)
GF-2860 (3.5 oz)	83 a	9 a (90)	83.2 a (39)	52 de (91)	4.7 e (99)	22.2 d (96)
GF-2860 (7 oz)	37.2 a	6.8 a (84)	25.7 a (58)	7.2 e (97)	9.2 e (97)	11.8 d (95)
MB1-203 (2 lb)	99.5 ^у а	37.3 a (66)	61.8 a (62)	89.3 cd (87)	140 cd (85)	173.5 c (75)
MB1-203 (4 lb)	104.3 a	63.3 a (46)	88.7 a (36)	145 bc (79)	96.2 cde (90)	53 cd (93)
MB1-206 (2 gal)	50.8 a	31.8 a (44)	109.5 a (0)	61 de (82)	44 de (91)	28.3 d (97)
NN1-0101 (3.2 fl oz)	60.8 a	25 a (63)	105.5 a (0)	0.2 e (100)	4 e (99)	0.7 d (100)
NN1-0101 (6.4 fl oz)	99 a	23.5 a (79)	6.7 a (96)	2.7 e (100)	65.8 de (93)	0 d (100)
No Fly (16 oz)	78 a	43.5 a (50)	77.5 a (40)	62.8 de (88)	43 de (94)	89.8 cd (84)
Preferal (14 oz)	51.7 a	46.2 a (20)	134.5 a (0)	131.5 bc 62()	200.2 bc (59)	83.8 cd (77)
Preferal (28 oz)	112.8 a	44.2 a (65)	172.3 a (0)	178.3 b (76)	296.5 b (72)	290 b (64)
Ultra Pure Oil (1 gal)	79.8 a	30.5 a (66)	38.2 a (71)	48.7 de (91)	32.3 de (96)	14.7 d (97)
Untreated	64 a	71.3 a (0)	105.5 a (0)	428.3 a (0)	603.2 a (0)	450.8 a (0)
			Eggs			
Flagship (8.5 oz)	69.5 a	82 b (78)	37.2 def (88)	9.7 e (97)	10.2 c (98)	16 e (96)
GF-2626 (5.5 fl oz)	251.3 a	34.8 b (97)	12.8 ef (99)	14.8 e (99)	3.8 c (100)	6.5 e (100)
GF-2626 (11 fl oz)	170.2 a	46.5 b (95)	29 def (96)	17.5 e (98)	5.7 c (100)	7.3 e (99)
GF-2860 (3.5 oz)	50.2 a	57.2 b (79)	58.2 c-f (74)	42 de (83)	14.8 c (96)	8.3 e (97)
GF-2860 (7 oz)	141 a	55.2 b (93)	10.8 f (98)	11.8 e (98)	3.3 c (100)	2.3 e (100)
MB1-203 (2 lb)	79.8 a	100 b (77)	185 abc (47)	107.5 cd (73)	86.3 bc (86)	83.8 de (81)
MB1-203 (4 lb)	64.3 a	129 b (63)	46 c-f (84)	52.5 de (84)	28 c (94)	43.3 de (88)
MB1-206 (2 gal)	76.5 a	77.3 b (82)	285.7 a (15)	35 de (91)	43.8 bc (93)	102 de (76)
NN1-0101 (3.2 fl oz)	56.7 a	54 b (82)	35.8 def (86)	3.3 e (99)	4 c (99)	2 e (99)
NN1-0101 (6.4 fl oz)	62 a	69.8 b (79)	7.7 f (97)	4 e (99)	35.5 bc (93)	2.5 e (99)
No Fly (16 oz)	95.5 a	117.5 b (77)	137.5 b-f (67)	49.2 de (90)	59 bc (92)	210.6 bc (60)
Preferal (14 oz)	66.2 a	122.3 b (66)	91.8 c- (68)f	186 b (44)	185.3 bc (65)	127.3 cd (65)
Preferal (28 oz)	47.3 a	113.8 b (55)	154.3 a-e (26)	157.5 bc (34)	206.2 b (45)	241.2 ab (8)
Ultra Pure Oil (1 gal)	81.3 a	82.5 b (81)	166.3 a-d (53)	82.5 cde (80)	65.3 bc (90)	74.8 de (83)
Untreated	59.3 a	319.7 a (0)	260.3 ab (0)	300 a (0)	468.7 a (0)	327.3 a (0)

 Table 22 . Efficacy of foliar applications for immature uncaged Bemisia B Biotype Whiteflies on Poinsettia 'Saturnis', Frank, 2012.

^z Population counted on 2 leaves per plant and cut 1.41 in² (9.07 cm²) disks out of them.

^y All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Gilrein, 2012. During 2012, Gilrein tested several products applied as foliar sprays for their activity against *Bemisia tabaci* B biotype on poinsettia (**Table 23**). All treatments provided significant control of immatures by the end of the trial, though both rates of NNI-0101 and the standard Safari were significantly more effective than all others, followed closely by the higher rate of GF-2860, Ultra Pure Oil and the higher rate of GF-2626 (Table). Some phytotoxicity was observed in plants treated withUltraPure oil and MBI-206 but not in any other treatments.

 Table 23. Efficacy of foliar applications for immature uncaged Bemisia B Biotype Whiteflies on

 Poinsettia 'Orion Red' – Application Rates and Dates, Gilrein, 2012.

Treatment (Active Ingredient)	Data / 100 gal		Application Dates					
Treatment (Active Ingredient)	Rate / 100 gai	9/10	9/17	9/24	10/1	10/9		
GF-2626 (sulfoxaflor)	5.5 fl oz	Х		Х		Х		
GF-2626 (sulfoxaflor)	11 fl oz	Х		Х		Х		
GF-2860 (spinoteram + sulfoxaflor)	3.5 oz	Х		Х		Х		
GF-2860 (spinoteram + sulfoxaflor)	7 oz	Х		Х		Х		
MB1-203 (<i>Chromobacterium subtsugae</i> strain PRAA4-1T)	2 lb	X	Х	Х	Х	Х		
MB1-203 (<i>Chromobacterium subtsugae</i> strain PRAA4-1T)	4 lb	X	Х	Х	Х	Х		
MB1-206 (Burkholderia sp. strain A396)	2 gal	Х	Х	Х	Х	Х		
NNI-0101 SC (pyrifluquinazon)	3.2 floz	Х		Х		Х		
NNI-0101 SC (pyrifluquinazon)	6.4 floz	Х		Х		Х		
Preferal (Isaria fumosoroseus)	14 oz	Х		Х		Х		
Preferal (Isaria fumosoroseus)	28 oz	Х		Х		Х		
Safari 20SG (dinotefuran)	8 oz	Х			Х			
Ultra Pure Oil (Petroleum Oil)	1 gal	Х		Х		Х		
Untreated (water only)		X	X	X	X	X		

	Population Counts, Means Separations, and Henderson's Percent Control x, y									
	0 DAT	4 DAT	11 DAT	18 DAT	24 DAT	33 DAT	42 DAT	46 DAT	52 DAT	52 DAT*
Treatment (Rate)	9/10	9/14	9/21	9/28	10/4	10/13	10/22	10/26	11/1	11/1
CE 2626 (5.5 fl oz)	27.2 2	20.0 + (1)	29.3 ab	36.6 bc	97.9 ab	77.6 bcd	51.8 bc	53.1 bcd	51.0 bcd	23.1 bcd
GP-2020 (5.5 H 02)	27.2 a	29.9 a (1)	(42)	(66)	(44)	(71)	(73)	(79)	(75)	(71)
GE_{-2626} (11 fl oz)	18.8 9	18.1 abc	21.1 ab	19.0 b-e	25.4 cd	19.6 fg	1934(85)	18.5 ef(89)	26.6 cd	7.4 cde
01-2020 (11 11 02)	10.0 a	(13)	(40)	(75)	(79)	(90)	17.5 u (65)	10.5 CI (07)	(81)	(91)
$GE_{-2860}(3.5.07)$	24.0.2	11.0 abc	26.1 ab	17.0 cde	27.6 cd	36.0 def	36.8 cd	27.6 cde	178d (90)	5.5e(93)
01-2800 (5.5 02)	24.0 a	(59)	(42)	(82)	(82)	(85)	(78)	(88)	17.8 u (90)	5.5 C (95)
$GE_{-2860}(7.07)$	20.1.2	19.1 + (14)	15.1 ab	9.6 cde	18.6 de	9.0 gh(96)	19e (97)	7.5 fg (96)	$7.3 e^{(95)}$	6.0 de (93)
GI-2800 (7 02)	20.1 a	19.1 a (14)	(60)	(88)	(86)	9.0 gii (90)	4.90(97)	7.5 lg (90)	7.5 C (95)	0.0 dc (93)
MB1-203 (2 lb)	20.9.2	3.4 bc (85)	16.5 ab	29.0 bcd	46.6 a-d	60.5 cde	65.9 abc	49.8 bcd	59.4 bc	30.4 h (62)
MD1 203 (210)	20.7 a	5.4 00 (05)	(58)	(75)	(66)	(71)	(55)	(74)	(63)	50.40 (02)
MB1-203 (4 lb)	27 Q a	4.3 c (86)	15.0 ab	20.1 b-e	33.4 bcd	52.8 c-f	56.6 bc	52.4 bc	55.4 bc	29.4 h (63)
MD1 203 (410)	27.0 a	4.5 € (00)	(70)	(82)	(81)	(80)	(70)	(79)	(73)	27.40(03)
MBI-206 (2 gal)	19 O a	20.9a(1)	35.6a(0)	48.0 ab	78.8 ab	78.1 bc	70.5abc	47.4 bcd	75.3 ab	50.1 ab
11111 200 (2 gui)	1).0 u	2019 u (1)	55.0 u (0)	(38)	(36)	(59)	(48)	(73)	(48)	(38)
NNI-0101 SC (3.2 fl oz)	24.8 a	18.6 a (32)	13.6 ab (71)	7.4 de (93)	4.9 f (97)	0.9 h (100)	0.0 f (100)	0.3 g (100)	0.0 f (100)	0.0 e (100)
		11.1.abc	(71)							
NNI-0101 SC (6.4 fl oz)	27.1 a	(63)	8.4 b (83)	2.3 e (98)	4.5 f (97)	0.4 h (100)	0.0 f (100)	0.0 g (100)	0.0 f (100)	0.0 e (100)
Proforal (14 oz)	10.0 a	$21.8 \circ (1)$	24.4 ab	31.8 bc	106.0 ab	121.1 b	111.9 ab	92.0 h (55)	83.1 ab	43.0 h (42)
Flelelal (14 02)	19.9 a	21.0 a (1)	(34)	(60)	(18)	(39)	(20)	83.00(33)	(45)	43.90 (42)
Proforal (28 oz)	20.6 a	$21.0 \circ (4)$	15.3 ab	10.9 cde	78.3 abc	103.8 bc	96.0 ab	70.3 h (58)	83.8 ab	32.1 bc
Fielefal (28 02)	20.0 a	21.9 a (4)	(60)	(87)	(41)	(49)	(34)	79.50(58)	(47)	(60)
Safari 20SC (8 oz)	22.4 a	10.3 abc	11.4 ab	580(94)	$4.6 {\rm of} (07)$	1.6 h (00)	1.1 f(00)	$1.3 \sigma(99)$	58(07)	$21 e^{(07)}$
		(58)	(73)	5.8 C ()4)	4.0 CI ()77)	1.0 II (77)	1.11()))	1.5 g ()))	5.8 (77)	2.1 C (97)
UltraPure Oil (1 gal)	21.8 .	14.4 ab	13.4 ab	19.5 b-e	50.4 a-d	27.0 efg	21.0.4 (86)	26.0 def	21.04(87)	0.0 e(100)
	21.0 a	(40)	(67)	(78)	(64)	(88)	21.0 d (80)	(87)	21.0 d (07)	0.0 C (100)
Untreated (water only)	20.6 a	22.8 ab (0)	38.4 a (0)	83.3 a (0)	133.4 a (0)	205.0 a (0)	145.6 a (0)	190.3 a (0)	157.3 a (0)	80.3 a (0)

Table 24. Efficacy of foliar applications for immature uncaged Bemisia B Biotype Whiteflies on Poinsettia 'Orion Red', Gilrein, 2012.

^y Population counted in a 1-inch² area on eight randomly selected middle-aged leaves per plant. ^x Means within columns followed by the same letter are not significantly different at p=0.05 (Tukey's HSD).

* Number of empty pupal cases.

Chong, 2013. During 2013, Chong tested several products applied as foliar sprays for their activity against *Bemisia tabaci* B biotype on ornamental kale (**Table 25**). When compared among all products tested in this study, A20520A, GF-2860 and NNI-0101 outperformed Ultra Pure Oil and Judo in their effectiveness in reducing the densities of nymphs and adults (**Table 26**). The relatively poor performance against the adult population may be the result of constant invasion of adults from the untreated and heavily infested colony plants kept in the same greenhouse. No treatment caused phytotoxicity to ornamental kales in this study.

	D-4- / 1001	Application Dates						
l reatment (Active Ingredient)	Rate / 100 gai	10/24	10/30	11/6	11/13	11/20		
A20520A ¹ (cyantraniliprole)	8 fl oz	Х		Х				
A20520A ¹ (cyantraniliprole)	16 fl oz	Х		Х				
GF-2860 ¹ (spinoteram + sulfoxaflor)	2 oz	Х		Х		Х		
GF-2860 ¹ (spinoteram + sulfoxaflor)	2.75 oz	Х		Х		Х		
GF-2860 ¹ (spinoteram + sulfoxaflor)	3.5 oz	Х		Х		Х		
Judo (spiromesifen)	4 fl oz	Х		Х				
MB1-203 (<i>Chromobacterium subtsugae</i> strain PRAA4-1T)	2 lb	Х		Х		Х		
MB1-203 (<i>Chromobacterium subtsugae</i> strain PRAA4-1T)	4 lb	X	X	X	X	X		
NNI-0101 SC (pyrifluquinazon)	1.6 fl oz	Х		Х		Х		
NNI-0101 SC (pyrifluquinazon)	3.2 fl oz	Х		Х		Х		
Paraffinic oil	1 %	Х		Х		Х		
Proud 3 (thyme oil)	4 qt	Х	Х	Х	Х	Х		
Pyranica 3EC (tebufenpyrad)	16 fl oz	Х		Х				
Water Check		Х		Х				

 Table 25. Efficacy of foliar applications for immature uncaged Bemisia B Biotype Whiteflies on

 Ornamental Kale 'Red Crane' – Application Rates and Dates, Chong, 2013.

¹ Capsil (at 6 fl oz/100 gal) were added to GF-2860 and A20520A treatments.

	Population Counts, Means Separations, and Henderson's Percent Control ^y									
Treatment (Rate)	0 WAT	1 WAT	2 WAT	3 WAT	4 WAT	5 WAT	6 WAT	7 WAT	8 WAT	
	10/23	10/30	11/6	11/13	11/20	11/27	12/4	12/11	12/18	
Nymphs										
A20520A ¹ (8 fl oz)	8.1 a	9.2 a (4)	10.8 a (0)	3.6 bc (67)	1.6 f (93)	2.2 d (94)	0.3 d (99)	0.5 d (99)	0.5 efg (99)	
A20520A ¹ (16 fl oz)	6.6 a	8.3 a (0)	3.8 bc (25)	6.2 b (31)	0.7 f (96)	1.3 d (95)	0.6 d (98)	0.2 d (99)	0.2 fg (99)	
GF-2860 ¹ (2 oz)	11.9 a	13.6 a (7)	7.1 ab (23)	3.6 bc (78)	5.5 c-f (84)	2.3 d (95)	0.3 d (99)	0.8 d (99)	1.4 efg (97)	
GF-2860 ¹ (2.75 oz)	8.7 a	9.8 a (8)	3.9 bc (42)	1.9 bc (84)	3.8 def (85)	0.9 d (98)	0.2 d (99)	0.7 d (99)	0.6 efg (98)	
GF-2860 ¹ (3.5 oz)	8.2 a	7.4 a (26)	3.1 bc (51)	1.0 c (91)	2.5 ef (89)	0.2 d (99)	0 d (100)	0.4 d (99)	0.4 fg (99)	
Judo (4 fl oz)	9.2 a	4.3 a (62)	2.8 bc (61)	6.1 b (51)	11.1 bc (57)	7.3 cd (81)	9.8 c (71)	9.4 cd (82)	10.6 def (72)	
MB1-203 (2 lb)	9.4 a	3.9 a (66)	4.4 bc (39)	3.2 bc (75)	9.8 b-e (63)	30.1 a (23)	36.7 a (0)	50.8 a (6)	34.1 a (13)	
MB1-203 (4 lb)	9.9 a	10.7 a (24)	7.8 ab (0)	13.6 a (0)	16.8 b (40)	12.2 bc (71)	24.7 b (33)	37.4 b (34)	28.7 ab (30)	
NNI-0101 SC (1.6 fl oz)	11.9 a	9.1 a (38)	3.2 bc (65)	2.1 bc (87)	4.4 def (87)	1.9 d (96)	0.5 d (99)	0.2 d (100)	0.1 g (100)	
NNI-0101 SC (3.2 fl oz)	9.6 a	11.6 a (2)	0.4 c (95)	2.6 bc (80)	0.9 f (97)	0.5 d (99)	0.3 d (99)	0.2 d (100)	0.1 g (100)	
Paraffinic oil (1 %)	9.1 a	7.4 a (34)	4.0 bc (43)	1.8 bc (85)	13.2 b (49)	4.1 cd (89)	3.7 cd (89)	10.3 cd (80)	10.7 de (72)	
Proud 3 (4 qt)	9.5 a	5.1 a (56)	6.8 ab (7)	6.0 b (53)	12.7 bc (53)	19.0 b (52)	26.9 b (24)	15.4 c (72)	22.4 bc (43)	
Pyranica 3EC (16 fl oz)	9.2 a	10.2 a (10)	10.1 a (0)	4.2 bc (66)	9.6 b-e (63)	5.0 cd (87)	8.8 cd (74)	15.8 c (70)	13.9 cd (64)	
Water Check	8.8 a	10.8 a (0)	6.8 ab (0)	11.9 a (0)	24.8 a (0)	36.8 a (0)	32.8 ab (0)	50.5 a (0)	36.6 a (0)	
	•	-	-	Adult	s	-	-	-	•	
A20520A ¹ (8 fl oz)	3.3	2.2	3.7	2.3 a-d	2.2 bcd	1.2 bc	3.0 abc	3.0 b-f	4.8 c-f	
A20520A ¹ (16 fl oz)	2.2	3.0	3.0	1.0 e	4.5 a	2.0 ab	2.8 a-d	4.3 abc	5.0 c-f	
GF-2860 ¹ (2 oz)	2.0	1.5	2.3	0.7 e	0.8 de	0.8 bc	1.2 de	2.2 c-f	4.5 def	
GF-2860 ¹ (2.75 oz)	2.2	1.8	3.8	1.3 cde	0.3 e	0.8 bc	1.2 de	1.5 ef	2.5 def	
GF-2860 ¹ (3.5 oz)	2.7	1.3	3.3	1.8 a-e	0.3 e	0.7 bc	1.2 de	1.8 ef	4.0 def	
Judo (4 fl oz)	2.8	3.0	3.7	1.2 de	2.7 bc	1.5 abc	1.8 b-e	4.7 ab	6.5 cd	
MB1-203 (2 lb)	2.0	2.2	3.8	2.5 abc	2.2 bcd	2.8 a	4.2 a	4.3 abc	8.5 bc	
MB1-203 (4 lb)	2.0	1.8	4.0	2.8 a	3.0 ab	2.0 ab	3.8 a	4.5 ab	4.8 c-f	
NNI-0101 SC (1.6 fl oz)	2.8	1.5	3.5	0.8 e	0.5 e	0.3 c	0.8 e	2.0 def	1.7 f	
NNI-0101 SC (3.2 fl oz)	2.2	1.8	2.8	1.3 cde	0.3 e	1.0 bc	0.8 e	1.0 f	4.2 def	
Paraffinic oil (1 %)	2.0	1.7	3.7	1.5 b-e	0.5 e	0.7 bc	1.7 cde	3.5 b-e	7.0 bcd	
Proud 3 (4 qt)	2.5	1.2	4.5	1.8 a-e	1.8 b-e	1.8 ab	2.7 a-d	4.2 a-d	5.7 cde	
Pyranica 3EC (16 fl oz)	2.5	1.8	2.5	1.3 cde	2.2 bcd	1.5 abc	3.3 abc	4.7 ab	12.5 a	
Water Check	1.5	3.2	4.7	2.7 ab	1.2 cde	1.5 abc	3.5 ab	6.0 a	10.7 ab	

Table 26. Efficacy of foliar applications for uncaged Bemisia B Biotype Whiteflies on Ornamental Kale 'Red Crane', Chong, 2013.

^z Population counted on three randomly selected 1-inch² areas on the middle section of each kale plant.

^x Means within columns followed by the same letter are not significantly different at p=0.05 (Fisher's LSD).

¹ Capsil (at 6 fl oz/100 gal) were added to GF-2860 and A20520A solutions.

Villavicencio, **2013.** During 2013, Villaviciencio tested several products applied as foliar sprays for their activity against *Bemisia tabaci* B biotype on vervain (Table 27). There were issues with the methodology for counting nymphs at 2 and 3 weeks after initial application on October 11 so the results should be viewed with caution. Data from 4 and 5 WAT showed A20520A, GF-2860 and NNI-0101 providing the best overall control of nymphs (Table 28). No treatment caused phytotoxicity to vervain.

Table 27. Efficacy of foliar applications for immature uncaged Bemisia B Biotype Whiteflies on	
Vervain 'Superbena® Royale Peechy Keen' – Application Rates and Dates, Villavicencio, 2013	•

Treatment (Active Ingredient)	Data / 100 gal	Application Dates					
Treatment (Active Ingredient)	Kate / 100 gai	10/11	10/18	10/25	11/1	11/8	
A20520A (cyantraniliprole)	8 fl oz	Х		Х			
A20520A (cyantraniliprole)	16 fl oz	Х		Х			
GF-2860 ¹ (spinoteram + sulfoxaflor)	2 oz	Х		Х			
GF-2860 ¹ (spinoteram + sulfoxaflor)	2.75 oz	Х		Х			
GF-2860 ¹ (spinoteram + sulfoxaflor)	3.5 oz	Х		Х			
Judo (spiromesifen)	4 fl oz	X			Х		
MB1-203 (<i>Chromobacterium subtsugae</i> strain PRAA4-1T)	2 lb	X	Х	X	Х	Х	
MB1-203 (<i>Chromobacterium subtsugae</i> strain PRAA4-1T)	4 lb	X	Х	X	Х	Х	
MBI-206 (<i>Burkholderia</i> sp. strain A396)	1 ga	X	Х	Х	Х	Х	
NNI-0101 SC (pyrifluquinazon)	1.6 fl oz	Х		Х		Х	
NNI-0101-SC (pyrifluquinazon)	3.2 fl oz	Х		Х		Х	
Proud 3 (thyme oil)	4 qt	X	Х	Х	Х	Х	
Ultra Pure Oil (Petroleum Oil)	1 gal	X		Х		Х	
Untreated							

¹ Capsil (at 6 fl oz/100 gal) were added to GF-2860 treatments.

Population Counts, Means Separations, and Henderson's Percent Control ^y Treatment (Rate) 0 WAT 1 WAT **2 WAT** 3 WAT 4 WAT 5 WAT 6 WAT 7 WAT 10/17 10/2410/31 11/14 10/1011/711/21 11/28**Immatures** 0.0 a (100) A20520A (8 fl oz) 12.8 a 2.7 c-f (29) 0.2 d (35) 0.7 d (90) 0.0 d (100) 2.2 cd (62) 0.7 b (81) A20520A (16 fl oz) 3.0 a 10.7 abc (0) 0.7 cd(0)0.3 a (0) 0.0 d (100) 0.8 d (43) 0.7 d (49) 0.0 b (100) GF-2860 + Capsil (2 oz) 52.3 a 0.5 def (97) 0.2 d (84) 0.2 d (99) 1.0 d (96) 0.3 d (100) 1.2 b (92) 0.0 a (100) GF-2860 + Capsil (2.75 oz) 5.4 a 0.4 ef (75) 0.0 d (100) 0.4 d (86) 0.2 d (92) 0.8 b (47) 0.2 a (0) 0.8 d (67) GF-2860 + Capsil (3.5 oz) 28.0 a 0.1 f (99) 0.1 d (85) 0.0 a (100) 1.7 d (89) 0.1 d (99) 0.3 d (98) 0.1 b (99) 9.7 a 7.8 c-f (58) Judo (spiromesifen) 0.0 d (100) 0.0 a (100) 1.0 d (81) 0.7 d (85) 0.3 d (93) 1.5 b (45) MB1-203 (2 lb) 17.7 a 20.5 a (0) 5.8 ab (0) 1.0 a (0) 12.8 bc (0) 15.2 ab (0) 10.5 b (0) 10.8 a (0) MB1-203 (4 lb) 58.3 a 13.7 a-d (21) 7.2 a (0) 0.2 a (83) 23.3 ab (27) 9.3 b (66) 8.3 b (69) 13.3 a (19) 2.5 bc (0) MBI-206 (2 gal) 12.3 a 5.7 a-e (0) 0.2 a (19) 6.2 c (8) 5.5 c (5) 6.0 b (0) 7.5 a (0) NNI-0101 SC (1.6 fl oz) 24.0 a 5.7 abc (20) 1.2 cd(0)0.7 a (0) 0.5 d (96) 0.0 d (100) 0.8 d (93) 1.2 b (82) NNI-0101 SC (3.2 fl oz) 8.5 a 9.7 b-f (0) 0.7 cd(0)0.0 a (100) 0.0 d (100) 0.0 d (100) 0.3 d (92) 1.3 b (46) 3.7 c-f (52) Proud 3 (1 gal) 25.7 a 1.0 cd(0)1.0 a (0) 8.8 bc (37) 6.0 c (51) 4.3 bc (63) 7.3 a (0) Ultra Pure Oil 7.0 a 3.3 c-f (0) 2.3 d (40) 0.7 d (79) 0.7 b (64) 0.3 d (0) 0.2 a (0) 1.8 d (44) Untreated 49.8 a 14.8 ab (0) 1.2 cd(0)1.0 a (0) 27.2 a (0) 23.5 a (0) 22.7 a (0) 14.0 a (0) Adults 1.2 fg (84) 5.7 a (0) 5.7 ab (0) 9.8 bcd (47) 10.0 ab (0) A20520A (8 fl oz) 15.2 abc 1.8 cde (28) 3.8 def (54) A20520A (16 fl oz) 5.8 def 9.0 abc (0) 3.7 a-d (0) 0.7 ef (26) 2.3 b (0) 2.7 def (14) 4.0 ef (43) 10.3 ab (0) GF-2860¹ (2 oz) 24.2 a 4.3 cde (65) 3.8 abc (42) 3.2 bc (19) 2.8 b (57) 4.8 bcd (63) 14.0 bc (52) 11.5 ab (27) GF-2860¹ (2.75 oz) 10.8 b-f 5.2 b-e (5) 7.4 a (0) 0.8 ef (54) 4.2 ab (0) 3.8 c-f (35) 9.0 b-e (31) 6.8 bcd (0) GF-2860¹ (3.5 oz) 10.7 а-е 1.0 g (82) 4.3 abc (0) 1.0 ef (43) 3.4 ab (0) 3.9 cde (33) 10.1 bc (22) 7.6 bc (0) 18.5 ab 5.7 b-e (39) 1.7 de (66) 2.5 cde (18) 4.5 ab (9) 13.7 bc (39) Judo (spiromesifen) 1.8 ef (82) 10.3 ab (14) MB1-203 (2 lb) 20.3 ab 9.2 bcd (11) 5.7 abc (0) 4.3 bc (0) 14.8 ab (0) 7.5 abc (32) 10.0 bc (59) 6.3 bcd (52) 10.3 a (0) MB1-203 (4 lb) 9.3 b-f 22.0 ab (0) 8.0 ab (0) 6.2 ab (0) 12.2 ab (0) 12.5 bc (0) 7.5 abc (0) MBI-206 (2 gal) 9.0 ab (0) 4.8 f 7.0 a (0) 5.0 ab (0) 7.0 ab (0) 4.0 b-e (0) 13.2 b (0) 5.2 bcd(0)NNI-0101 SC (1.6 fl oz) 9.5 b-f 6.2 b-e (0) 2.3 b-e (10) 1.0 ef (36) 0.5 c (80) 1.3 fg (75) 3.0 f (74) 3.5 cde (43) NNI-0101 SC (3.2 fl oz) 13.0 a-d 4.2 de (68) 1.3 e (63) 0.2 f (51) 0.3 c (91) 0.2 g (97) 3.2 f (80) 2.2 e (74) 5.7 b-e (0) Proud 3 (1 gal) 7.8 c-f 2.2 cde(0)2.8 bcd (0) 3.5 ab (0) 2.2 def (48) 5.2 def (45) 7.2 bcd (0) Ultra Pure Oil (1 gal) 3.2 ef (0) 2.7 b-e (0) 1.3 def (0) 5.0 ab (0) 4.0 def (0) 6.0 c-f (20) 3.8 de (6) 6.2 ef Untreated 33.5 a 17.0 a (0) 9.0 a (0) 5.5 ab (0) 9.0 a (0) 18.2 a (0) 40.7 a (0) 21.8 a (0)

Table 28. Efficacy of foliar applications for uncaged Bemisia B Biotype Whiteflies on Vervain, 'Superbena® Royale Peechy Keen' Villavicencio, 2013.

^z Population counted from 2 leaves per plant. ^x Means within columns followed by the same letter are not significantly different at p=0.05 (Student's t-test).

Silverleaf Whitefly Q Biotype and mixed populations

There were several objectives to studying Q Biotype whiteflies and what control measures are viable. The first arose because, while not of regulatory significance, Q biotype whiteflies were new to the United States during the 2004 poinsettia growing season and could cause significant economic decline if not eradicated or managed sufficiently on several crop commodities including ornamental horticulture, vegetables, and cotton. Determining what could effectively eradicate a newly discovered population was critical, in other words, what chemical tools would provide 100% control. The next objective was to study biological tools knowing that these products may have utility in managing ongoing infestations. The third area of study was to examine the level of efficacy achieved with tank mix or rotational programs. The final objective was to study how quickly an isolated Q biotype population would develop field tolerance to the two most promising eradication tools. In the following pages, these objectives are summarized under appropriate headers followed by a detailed description of each experiment.

Efficacy Screen – Chemical Tools

The goal for this series of experiments was to assess registered insecticides known for whitefly activity and active ingredients in development for their efficacy against the *Bemisia tabaci* Q biotype and mixed B and Q biotype populations. Between 2005 and 2009, 11 experiments were conducted testing 18 chemically-based products on (Table 29 - p37) in three locations: Cornell University's Long Island Horticulture Research Center, the Georgia Mountain Experiment Station, and the University of California. The level of infestation at the start of each experiment varied from fairly light to quite heavy: from 2 to 88 immature whiteflies per leaf. In some experiments, the treated plants were caged; in others the adult whiteflies were allowed to move from plant to plant. Poinsettia was the host crop for all tests.

As part of the initial Q biotype screen in 2005 and 2006, Bethke, Gilrein and Oetting tested foliar and drench applications of active ingredients from several chemical classes to gauge what would be most effective for the newly introduced populations, knowing that many may not perform well given reports of resistance internationally. In the experiment conducted by Bethke, whitefly adults were caged onto poinsettia plants and encouraged to lay eggs; these eggs hatched, treatments applied, and counts of emerged adults were taken. For the experiments conducted by Gilrein and Oetting, whitefly adults were allowed to migrate among treatments applied to the poinsettia plants. In Bethke's experiment to test the 5 commercially available neonicotinoids, Safari and TriStar significantly reduced adult emergence while Celero, Flagship, and Marathon suppressed populations (Table 33 - p43). In Gilrein's 2005 experiment (Table 35 - p44), foliar applications of Distance, Flagship, Judo, Marathon, and Safari were examined against relatively light infestations. Judo and Safari were the most effective treatments with the lowest number of immature whiteflies on plants after the second application and through the end of the trial (Table 36 - p45). Similarly, in Oetting's first experiment in 2005 (Table 37 - p46), Safari and Judo appeared to be the most efficacious compounds (Table 38 - p 47). The other products tested included drenches of Aria 50SG, Celero, Acelepryn, and Marathon II, and foliar applications of BW420. Distance. and Milstop. During 2006, Oetting continued the open greenhouse testing with Acelepryn, Pedestal, Safari, and TriStar along with BugOil and EcoTrol EC (Oetting 2006b, Table 46 - p55). By 22 DAT, BugOil, Safari and TriStar provided excellent control (>98%) while the other products provided mediocre suppression at best (Table 47 - p56).

By 2007, it was clear the best chemical classes were the neonicotinoids and the new Judo active ingredient. From 2007 through 2009, Gilrein and Oetting then continued to compare neonicotinoids with Acelepryn, Aria, Avid, Judo, Kontos, and Sanmite (Table 29 - p37). Among the neonicotinoids, Safari and TriStar consistently performed the best with Celero, Flagship and Marathon exhibiting poor to

marginal control of immature whiteflies. Acelepryn and Aria had little impact on immature whiteflies, but Judo, Kontos and Sanmite exhibited good to excellent efficacy (Oetting 2007e, Table 61 - p70; Oetting 2008e, Table 76 - p81; Gilrein 2009a, Table 80 - p84; Gilrein 2009b, Table 82 - p85).

Throughout this series of experiments, the best performing across the various levels of infestation and environmental conditions were Avid, Judo, Kontos, Safari, Sanmite, and TriStar.

Efficacy Screen – Biological Tools

Between 2005 and 2009, 11 experiments were conducted testing 18 products on *Bemisia tabaci* Q biotype and populations mixed with the B biotype (Table 30 - p38). Of these biological and potentially ecologically more viable tools, the best performing across the various levels of infestation and environmental conditions were Botanigard ES, BugOil and M-Pede, but the results were inconsistent among experiments. Although the 21 DAT assessment point may seem ambitious given the biological nature of many of these products, in the later rating dates product performance did not appear to increase dramatically. It is unclear how these would function, however, under commercial settings and in rotational programs. The Botanigard ES formulation caused significant phytotoxicity in one experiment, as did Organocide and sorbitol octanoate in another.
Сгор							Poinsettia					
Experiment	Bethke 2005a	Bethke 2005b	Gilrein 2005	Oetting 2005a	Oetting 2005b*	Gilrein 2006a	Gilrein 2006b*	Oetting 2006b	Oetting 2007e	Oetting 2008e	Gilrein 2009a	Gilrein 2009b*
Initial Population Level of Untreated per leaf	n/a	n/a	2.1 to 2.4	2.3 to 6.5	2.6 to 7.0	15.2 to 22.3	57.4 to 75.2	2.7 to 8.3	6.4 to 37.2	3.1 to 5.1	31.2 to 43.2	65.0 to 88.1
DAT of assessment	21 DAT	24 DAT	21 DAT	21 DAT	21 DAT	17 DAT	20 DAT	22 DAT	21/28 DAT	22 DAT	21 DAT	20 DAT
Population Assessed	Adults							Immatu	res			
Population Counts per Leaf on Untreated	n/a	n/a	16.8	23.1	1 9.1 35.4 59.2 13.8 38.2 10.1					10.1	178.2	523.4
Product Table	Table 33	Table 34	Table 36	Table 38	Table 40	Table 42	Table 44	Table 47	Table 61	Table 76	Table 80	Table 82
Acelepryn				+/-				-	-			
Aria 50SG				-					- (++ 35 DAT)	-		
Avid 0.15EC		+					+			+		++
Celero 16WG	-			+/-					- (++ 35 DAT)			
Distance 0.86EC		++	-	+								
DuraGuard		-										
DPX-HGW86								++ (but variable)				
Flagship 25WG	-		-		+		+/-		- (+ 35 DAT)	+		
Judo 4F		++	+	++		+			- (++ 35 DAT)	++		
Kontos									- (++ 35 DAT)	+	++	++
Marathon II 2F	-		-	+					- (++ 35 DAT)	+	+/-	
Ornazin						-						
Orthene + Tame					+		+/-					
Pedestal								-				
Safari 20SG	++		+			+	- (++ 45 DAT)	++	++	+	++	++
Safari 25WG				++								
Sanmite		+								+		++
Talstar		-										
Talus		-										
Tame		-										
TriStar 30WSP	++							++				++
TriStar 70WSP					++				- (++ 35 DAT)	++	++	

Table 29. General summary of efficacy for immature Bemisia tabaci Q and B biotypes across infestation levels, application types and rates.

* Not an IR-4-sponsored experiment.

¹ Rating Scale: ++ = clearly statistically better than untreated and greater than 95% control; += statistically better than untreated and between 85 and 95% control; +/- statistically better than untreated with control between 70 and 85%; - = statistically equivalent to untreated and/or efficacy less than 70%.

² Where more than one rate or application type for a product was included in the experiment and each performed statistically different, the better rating is provided in this table.

Сгор					Poir	nsettia					Salvia
Product	Oetting 2005a	Oetting 2005b*	Gilrein 2006a	Gilrein 2006b*	Oetting 2006b	Oetting 2006c	Oetting 2007c	Oetting 2007f	Oetting 2008g*	Gilrein 2009b*	Oetting 2006a *
Initial Population Level of Untreated Controls	2.3 to 6.5	2.6 to 7.0	15.2 to 22.3	57.4 to 75.2	2.7 to 8.3	4.8 to 6.5	39.1 to 69.6	5.5 to 9.9	10.6 to 17.1	65.0 to 88.1	3.6 to 7.4
DAT of assessment	21 DAT	21 DAT	17 DAT	20 DAT	22 DAT	21 DAT	21 DAT	21 DAT	21 DAT	20 DAT	21 DAT
Stage Assessed		-		-		Immatures					
Population Counts per Leaf on Untreated Controls	23.1	9.1	35.4	59.2	13.8	38.4	46.9	8.9	87.3	523.4	13.2
BotaniGard 22WP			+/-			-				+	
BotaniGard ES		++	phyto	+/-			-		-		
BugOil					++			-			+/-
BW420	-										
Eco E-rase				-							
EcoTrol					-						
Met 52								-	-		
MilStop	+/-										
M-Pede			++	+						+/-	
Naturalis B		+						-			
NoFly							-	-	-		
Organocide				phyto							
QRD400						-					
Revoke			-								
Sorbitol octanoate				phyto							
Sucrocide			+/-								
SuffOil X (Synergy)										+	
TriCon						-					

Table 30. Overview of Efficacy for Biological Products.

* Not an IR-4-sponsored experiment.

¹ Rating Scale: ++ = clearly statistically better than untreated and greater than 95% control; += statistically better than untreated and between 85 and 95% control; +/- statistically better than untreated with control between 70 and 85%; - = statistically equivalent to untreated and/or efficacy less than 70%.

² Where more than one rate or application type for a product was included in the experiment and each performed statistically different, the better rating is provided in this table.

Management Programs

For Q biotype, it is critical to use all potential strategies to manage or eradicate this whitefly in greenhouses so that it does not establish in the landscape or field production areas. Part of the strategy is to tank mix or rotate products of different classes. Three experiments examined this concept during 2006 and 2007.

In the first experiment, foliar applications of Avid tank mixed with pyrethroids were examined along with applications of several products where tolerance issues might exist with the introduced Q biotype populations. Because this test was conducted in the open greenhouse, the immature whiteflies best represent the level of activity. None of the treatments provided particularly effective control until 28 DAT (Table 31 - p38). At this time the best treatment was Avid alone (91% control), but none of the other treatment regimes approached commercially acceptable control levels.

In the second experiment, the industry standard program of Marathon applications was compared to an IPM approach with applications initiated when whitefly populations were high; the Marathon program was also compared to Safari drenches with rotations of various foliar products to manage resistance. The initial Safari drench applications of Safari completely control whitefly populations so that no foliar treatment was necessary (Oetting 2007a, Table 33 - p41). The IPM strategy of applying Judo and then Avid when the whitefly populations reached a threshold did not provide the level of control envisioned because the populations exploded. Once Avid was applied populations did drop to acceptable levels. The Marathon program did provide good control of immature and adult whiteflies, but it did not eradicate them like the Safari drenches.

The third experiment was designed to examine several potential management programs under conditions where reinfestation could occur. An initial application of Safari was compared with Marathon, the standard initial drench. Both of these treatments were to be followed up with foliar applications of rotational products designed to minimize resistance. However, the initial treatment of Safari completely controlled whitefly populations so that no foliar treatment was necessary. Initial foliar applications of Celero, Flagship, and Tristar followed by applications of Sanmite were compared. Celero and Flagship provided suppression at best, whereas TriStar did reduce populations although not to commercially acceptable levels. A standard foliar application of Orthene + Tame with follow up applications of Avid did not provide acceptable control. In the previous screening tests, most treatments performed reasonably well in controlling Q biotype whiteflies at low to medium population levels. This experiment clearly demonstrates that very few products can effectively manage out-of-control whitefly populations with constant heavy reinfestation.

Development of Tolerance

The Q biotype whitefly has a challenging resistance profile: this biotype has development tolerance to most classes of chemistry. Because it is prone to develop resistance, it was important to examine the development of resistance to the compounds that were currently able to reduce populations and to determine whether the tools could be used effectively after the development of resistance. Because the Georgia Mountain Research Center was remote from potentially impacted crops, this site was ideal to test the development of resistance where there was little chance escaped whiteflies could infest commercial crops. From 2007 through 2009, Oetting studied the shift in efficacy in adult and immature whiteflies as a result of constant exposure to Marathon, Judo, and Safari either as caged populations or uncaged populations with the ability to move from treatment to treatment.

In the experiments aimed at studying resistance development, there were Q whiteflies that survived most treatments with the exception of the higher rates of Safari in the caged tests (Table 31 - p 41). Marathon with the exception of the first experiment did not reduce the total number of whiteflies surviving at the end of the experiment in comparison to the untreated plants. In the second experiment, the lowest rates tested for Judo and Safari also had populations not significantly different from untreated plants. Although at the time, it was thought that Judo might be starting to exhibit resistance, it may have been that the 2 oz rate was a sublethal dose instead, similar to the conclusion reached for Safari. When comparing the ratio of treatment survivors to untreated survivors, there does not appear to be a shift over time towards more tolerant whiteflies (Table 32 - p 42). The experiments with ratios higher than 0.1 are those conducted in the open greenhouse where adults can migrate from treatment to treatment. These live whiteflies may be moving into the treated plants from the Marathon and untreated plants rather than a reflection of a buildup of tolerance to Judo and Safari.

					Numb	er (immat	ures & ad	ults) survi	iving at th	e last read	ling date			
	Researcher	Oetting 2005a	Oetting 2006b	Oetting 2007a	Oetting 2007b	Oetting 2007d	Oetting 2007e	Oetting 2007g	Oetting 2008a	Oetting 2008b	Oetting 2008c	Oetting 2008d	Oetting 2008e	Oetting 2008f
	First App. Date	11/1/05	8/30/06	3/20/07	3/20/07	7/11/07	7/11/07	9/19/07	3/12/08	3/12/08	3/12/08	5/21/08	5/21/08	9/9/08
	Last App. Date	11/1/05	8/30/06	5/15/07	3/20/07	7/18/07	7/18/07	10/3/07	3/26/08	3/26/08	3/26/08	6/10/08	6/10/08	9/24/08
Treatment	Last Reading Date	12/14/05	10/11/06	5/29/07	5/29/07	9/6/07	9/6/07	11/28/07	5/1/08	4/24/08	5/8/08	6/24/08	6/24/08	10/11/08
Treatment	Days after last application	43 DAT	42 DAT	14 DAT	70 DAT	50 DAT	50 DAT	56 DAT	36 DAT	29 DAT	43 DAT	14 DAT	14 DAT	17 DAT
	Open or Cages	Open	Open	Caged	Open	Open	Open	Caged	Caged	Caged	Open	Caged	Open	Open
	Rate	Table 18	Table 27	Table 33	Table 35	Table 39	Table 41	Table 44	Table 47	Table 49	Table 51	Table 53	Table 54	Table 56
Judo	Foliar – 2 oz					0.8	31.6	42.9						
Judo	Foliar – 4 oz	11.3				1.1	26.4		3.5	1.0	5.5	0.6	0.5	
Judo	Foliar – 8 oz								2.3	0.3	2.2	0.6	1.7	5.1
Judo	Foliar – 12 oz											1	1.6	
Kontos	Foliar – 1.7 oz											1.6	1.2	14.8
Kontos	Foliar - 3.4 oz						13.9							
Marathon	Drench – 1.7 or 2 fl oz					13.8	52.8		59.3	15.9	55.2	49.1	9.7	29.2
Marathon	Drench - 5.4 fl oz	25.7												
Marathon	Drench / Foliar - 3.4 fl oz / 1.7 fl oz			15.2										
Safari 20SG	Foliar – 4 oz								1.7	2.0	18.2			4.9
Safari	Foliar – 8 oz								0.5	0.0	15.3			
Safari	Drench – 1.5 oz							87.8						
Safari	Drench – 3 oz					0.6	6.6	10.4						
Safari	Drench – 6 oz					0.0	4.4	1.3				1.7	2.1	
Safari	Drench – 8 oz								0.0	0.5	2.0	0.2	0.5	
Safari	Drench – 9 oz							0.0	0.0	0.1				
Safari	Drench – 12 oz		8.4	0.0	2.4						6.8			
Safari 25WG	Drench - 24 oz	0.5												
Untreated		86.5	204.6	201.4	359.6	40.4	65.2	78.3	55.2	14.1	118.9	39.8	9.6	74.5

 Table 31. Number (immatures & adults) surviving at the last reading date

Ratio of treated survivors to untreated populations surviving at the last reading date														
	Researcher	Oetting 2005a	Oetting 2006b	Oetting 2007a	Oetting 2007b	Oetting 2007d	Oetting 2007e	Oetting 2007g	Oetting 2008a	Oetting 2008b	Oetting 2008c	Oetting 2008d	Oetting 2008e	Oetting 2008f
	First App. Date	11/1/05	8/30/06	3/20/07	3/20/07	7/11/07	7/11/07	9/19/07	3/12/08	3/12/08	3/12/08	5/21/08	5/21/08	9/9/08
	Last App. Date	11/1/05	8/30/06	5/15/07	3/20/07	7/18/07	7/18/07	10/3/07	3/26/08	3/26/08	3/26/08	6/10/08	6/10/08	9/24/08
Treatment	Last Reading Date	12/14/05	10/11/06	5/29/07	5/29/07	9/6/07	9/6/07	11/28/07	5/1/08	4/24/08	5/8/08	6/24/08	6/24/08	10/11/08
Treutinent	Days after last application	43 DAT	42 DAT	14 DAT	70 DAT	50 DAT	50 DAT	56 DAT	36 DAT	29 DAT	43 DAT	14 DAT	14 DAT	17 DAT
	Open greenhouse or Cages	Open	Open	Caged	Open	Open	Open	Caged	Caged	Caged	Open	Caged	Open	Open
	Rate	Table 18	Table 27	Table 33	Table 35	Table 39	Table 41	Table 44	Table 47	Table 49	Table 51	Table 53	Table 54	Table 56
Judo	Foliar – 2 oz					0.0	0.5	0.5						
Judo	Foliar – 4 oz	0.1				0.0	0.4		0.1	0.1	0.0	0.0	0.1	
Judo	Foliar – 8 oz								0.0	0.0	0.0	0.0	0.2	0.1
Judo	Foliar – 12 oz											0.0	0.2	
Kontos	Foliar – 1.7 oz											0.0	0.1	0.2
Kontos	Foliar - 3.4 oz					0.0	0.2							
Marathon	Drench – 1.7 or 2 fl oz					0.3	0.8		1.1	1.1	0.5	1.2	1.0	0.4
Marathon	Drench - 5.4 fl oz	0.3												
Marathon	Drench / Foliar - 3.4 fl oz / 1.7 fl oz			0.1										
Safari 20SG	Foliar – 4 oz								0.0	0.1	0.2			0.1
Safari 20SG	Foliar – 8 oz								0.0	0.0	0.1			
Safari 20SG	Drench – 1.5 oz							1.1						
Safari 20SG	Drench – 3 oz					0.0	0.1	0.1						
Safari 20SG	Drench – 6 oz					0.0	0.1	0.0				0.0	0.2	
Safari 20SG	Drench – 8 oz								0.0	0.0	0.0	0.0	0.1	
Safari 20SG	Drench – 9 oz							0.0	0.0	0.0				
Safari 20SG	Drench – 12 oz		0.0	0.0	0.0						0.1			
Safari 25WG	Drench - 24 oz	0.0												
Untreated		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

 Table 32. Ratio of Treatment Survivors to Untreated at the last reading date

Details for Each Experiment

The following experiments are arranged in alphanumeric order.

Bethke 2005a. In an initial screen for neonicotinoid activity, Bethke tested 4 products as drenches and 5 as foliar applications (Table 33 - p43). Adult whiteflies were caged onto poinsettia plants after application. One day later the adults were removed and the life cycle proceeded. Immatures were counted 8-10 days later, and the number of emerged whitefly adults assessed approximately 21 days after treatment.

Safari as a foliar or drench application and TriStar as a drench application were the best treatments providing >90% control approximately 21 days after treatment.

 Table 33. Efficacy of foliar and drench applications for immature caged Bemisia Q Biotype

 Whiteflies on Poinsettia, Bethke, 2005a.

Treatment (Active Ingredient)	Application Method – Rate per 100 gal	Initial Pupae	Emerged Adults	Henderson's % Control
Celero (clothianadin)	Foliar – 4 oz	23.0	6.2	73
Flagship 25WG (thiamethoxam)	Foliar – 4 oz	23.0	6.0	73
Marathon II 2F (imidacloprid)	Foliar – 50 ml	22.2	7.0	68
Safari 20SG (dinotefuran)	Foliar – 8 oz	22.2	0.4	98
Celero (clothianadin)	Drench – 3.4 g/3 gal	23.2	5.8	75
Flagship 25WG (thiamethoxam)	Drench – 10.2 g/3 gal	22.8	7.2	68
Marathon II 2F (imidacloprid)	Drench – 2.55 ml/3 gal	29.8	15.8	46
Safari 20SG (dinotefuran)	Drench – 24 oz/100 gal	23.0	0.6	97
TriStar	Drench – 1.9 g/3 gal	23.0	2.2	90
Unsprayed Control		22.2	21.8	0

Bethke 2005b. In a second screen for neonicotinoid activity, Bethke tested 8 products and 1 tank mix as foliar applications (Table 34 - p44). Adult whiteflies were caged onto poinsettia plants after application. One day later the adults were removed and the life cycle proceeded. Immatures were counted 9 days later, and the number of emerged whitefly adults assessed approximately 24 days after treatment. The tank mix of Avid and Talstar and the Judo application provided 100% control. Avid, Distance, and Sanmite also provided good reduction of whitefly populations.

Treatment	Rate per 100 gal	Initial Pupae	Emerged Adults	Henderson's % Control
Avid (abamectin)	8 fl oz	9.6	0.4 de	94
Avid+Talstar (abamectin + bifenthrin)	8 + 18 fl oz	12.4	0.0 e	100
Distance (pyriproxifen)	8 fl oz	9.8	0.2 de	97
Duraguard ME (chlorpyrifos)	50 fl oz	9.0	2.4 cd	60
Judo (spiromesifen)	4 fl oz	11.8	0.0 e	100
Sanmite (pyridaben)	6 oz	11.2	0.8 de	89
Talstar (bifenthrin)	18 fl oz	10.2	6.4 ab	5
Talus (buprofezin)	6 oz	9.8	4.8 ab	26
Tame (fenpropathrin)	16 fl oz	10.4	4.0 bc	42
Control		8.8	5.8 a	0

Table 34. Efficacy of foliar and drench applications for immature caged Bemisia Q Biotype Whiteflies on Poinsettia 'Freedom Bright Red', Bethke, 2005b.

Gilrein 2005. In this experiment foliar applications of standard whitefly-management tools and those new into the marketplace were examined (Table 35 - p44). Whitefly adults were allowed to migrate freely among treatments; in other words the plants and whiteflies were uncaged. Foliar applications of Distance, Flagship, Judo, Marathon, and Safari were applied 3 times approximately 10 days apart to poinsettia 'Freedom Red'. The immature populations prior to treatment ranged between 16.3 and 19.5 counted on eight leaves.

Judo and Safari were the most effective treatments with the lowest number of immature whiteflies on plants after the second application and through the end of the trial (Table 36 - p45). The level of control was greater than 91% for both treatments at 21 DAT and greater than 97% at 36 DAT. Distance, Flagship and Marathon did not provide adequate control with the rates used in this experiment. There was slight phytoxicity (chlorotic mottling) to bracts and upper leaves of plants treated with Distance at the end of the trial, but the final trial spray was made well after color appeared and the label prohibits applications after bract color in poinsettia.

Table 35. Efficacy of foliar applications for immature uncaged Bemisia B And Q Biotype Whiteflies on Poinsettia 'Freedom Red' – Application Rates and Dates, Gilrein, 2005.

Treatment (A stive Incredient)	Application Method –	Application Dates				
Treatment (Active Ingredient)	Rate per 100 gal	9/26	10/6	10/25		
Distance 0.86EC (pyriproxifen)	Foliar – 8 fl oz	Х	Х	Х		
Flagship 25WG (thiamethoxam)	Foliar – 2 oz	Х	Х	Х		
Judo 4F (spiromesifen)	Foliar – 4 fl oz	Х	Х	Х		
Marathon II 2F (imidacloprid)	Foliar – 1.7 fl oz	Х	Х	Х		
Safari 20SG (dinotefuran)	Foliar – 8 oz	Х	Х	Х		
Unsprayed Control						

Tuesdament (Active Incompliant)	Popu	lation Counts, Henderson's	Means Separat Percent Contro	tions, and ol ^y	Q:B Population
l reatment (Active Ingredient)	0 DAT 9/20	10 DAT ** 10/6	21 DAT ** 10/17	36 DAT * 11/1	DAT ^z
Distance 0.86EC (pyriproxifen)	18.4 a ^y	70.9 b (0)	113.3 c (25)	88.5 d (32)	11:1
Flagship 25WG (thiamethoxam)	16.3 a	33.4 ab (32)	69.4 b (48)	43.8 c (62)	10:2
Judo 4F (spiromesifen)	16.6 a	27.1 a (46)	9.4 a (93)	0.5 a (100)	4:0
Marathon II 2F (imidacloprid)	19.5 a	56.8 ab (4)	123.1 c (23)	67.0 d (52)	11:0
Safari 20SG (dinotefuran)	19.5 a	41.3 ab (30)	15.1 a (91)	3.5 b (97)	10:0
Unsprayed Control	16.5 a	50.0 ab (0)	134.6 c (0)	117.3 d (0)	8:2

Table 36. Efficacy of foliar applications for immature uncaged Bemisia B and Q Biotype Whiteflies on Poinsettia 'Freedom Red', Gilrein, 2005 ^z.

^z At the start of the experiment, Q was 100% of the population according to esterase assay (Dr. Frank Byrne) and mitochondrial cytochrome oxidase I gene analysis (Dr. Judy Brown). At the end of the experiment, B and Q populations varied slightly by treatment according to the esterase assay.

^y Populations counted on 8 fully expanded leaves.

^x Means within columns followed by the same letter are not significantly different at p=0.05 (Fisher's LSD). *Data were transformed prior to analysis using ln(y+1). **Data were transformed prior to analysis using sqrt(y).

Oetting 2005a. In this experiment, drenches and foliar applications were applied to Poinsettia 'Dynasty Red' and whitefly adults were allowed to migrate among treatments (**Table 37** - p46). 100% of the population was Q biotype. Drenches of Aria 50SG, Celero, Acelepryn, Marathon II and Safari were applied once, while foliar applications of BW420, Distance, Judo, and Milstop were applied two times 17 days apart. The immature populations prior to treatment ranged between 7.0 and 19.4 counted on three leaves, and the adult populations averaged between 1.2 and 2.6 on the same three leaves.

In this experiment Safari and Judo appear to be the most efficacious compounds (Table 38 - p47). Safari provided 91% control of immatures and adults one week after treatment with greater than 97% control of immatures and between 87% and 97% control of adults through 43 DAT. Judo provided less satisfactory control of adults, but control levels of immatures at 3 weeks after treatment were 98%. Distance and Marathon were better than was expected since 'Q' was reported to be completely resistant to both of these compounds. Both of these compounds performed well but did not control the 'Q' whitefly with one application. Marathon II exhibited between 74 and 93% control of immatures and between 41 and 82% control of adults, while Distance gave between 83 and 87% control of immatures starting at 21 DAT with little impact on adults. Aria, Celero, and MilStop significantly reduced whitefly populations but the level was not adequate and more applications or rotation with other compounds would be needed. Acelepryn and BW420 were the least effective.

Turodanová (A stino In sus disud)	Application Method –	Applicati	ion Dates
reatment (Active Ingredient)	Rate per 100 gal	11/1	11/18
Acelepryn (chloranitriprole)	Drench – 151 ml	Х	
Aria 50SG (flonicamid)	Drench – 120 g	Х	
BW420	Foliar – 0.8%	Х	Х
Celero 16WG (clothianadin)	Drench – 6.3 oz	Х	
Distance (pyriproxifen)	Foliar – 8 fl oz	Х	Х
Judo (spiromesifen)	Foliar – 4 fl oz	Х	Х
Marathon II (imidacloprid)	Drench – 5.4 fl oz	Х	
MilStop	Foliar – 2.5 lb	Х	Х
Safari 25WG (dinotefuran)	Drench – 24 oz	Х	
Check			

 Table 37. Efficacy of foliar and drench applications for uncaged Q Biotype Whiteflies on Poinsettia

 'Dynasty Red' – Application Rates and Dates, Oetting 2005a.

Treatment (Active Application Population Counts, Means Separations, and Henderson's Percent Control ^y								
Ingredient)	Method – Rate / 100 gal	Precount 10/25	8 DAT 11/9	15 DAT 11/16	21 DAT 11/22	29 DAT 11/30	35 DAT 12/6	43 DAT 12/14
		<u>8</u>	Imma	atures				
Acelepryn (chloranitriprole)	Drench – 151 ml	9.8 bc	10.4 cd (66)	12.4 bcd (70)	19.2 cd (77)	27.6 b (65)	33.4 abc (49)	38.9 bc (56)
Aria 50SG (flonicamid)	Drench – 120 g	7.0 c ^x	11.1 bcd (49)	12.4 bcd (58)	28.0 bc (53)	27.0 b (52)	11.4 de (76)	21.2 cde (66)
BW420	Foliar – 0.8%	10.2 bc	23.4 a (26)	20.4 abc (53)	52.4 ab (40)	27.9 b (66)	36.4 ab (47)	28.4 bcd (69)
Celero 16 WG (clothianadin)	Drench – 6.3 oz	11.6 abc	9.6 cd (73)	25.3 ab (49)	27.9 bc (72)	23.2 b (75)	18.0 bcde (77)	41.2 bc (61)
Distance (pyriproxifen)	Foliar – 8 fl oz	13.2 abc	20.9 ab (49)	15.6 bcd (72)	16.2 cd (86)	14.4 b (86)	14.8 cde (83)	15.3 cde (87)
Judo (spiromesifen)	Foliar – 4 fl oz	10.7 bc	11.2 bcd (66)	6.9 cd (85)	1.9 d (98)	3.8 b (96)	6.3 e (91)	5.6 de (94)
Marathon II (imidacloprid)	Drench – 5.4 fl oz	19.4 a	15.4 abc (74)	18.6 abcd (77)	11.3 cd (93)	13.2 b (92)	18.7 bcde (86)	20.9 cde (88)
MilStop	Foliar – 2.5 lb	14.7 abc	22.5 a (50)	23.3 abc (63)	29.4 bc (77)	28.4 b (76)	31.8 bcd (68)	54.9 ab (59)
Safari 25WG (dinotefuran)	Drench – 24 oz	17.8 ab	4.8 d (91)	2.4 d (97)	0.0 d (100)	0.0 b (100)	0.9 e (99)	0.0 e (100)
Check		8.1 c	25.0 a (0)	34.4 a (0)	69.3 a (0)	65.3 a (0)	54.1 a (0)	73.0 a (0)
			Ad	ults				
Acelepryn (chloranitriprole)	Drench - 151 ml	1.4 a	1.5 bc (54)	4.3 ab (14)	10.3 abc (17)	21.5 a (0)	12.1 ab (20)	9.8 ab (17)
Aria 50SG (flonicamid)	Drench – 120 g	1.6 a	0.5 c (86)	2.8 bc (51)	6.2 bc (56)	3.9 bc (82)	2.1 c (88)	6.9 abc (49)
BW420	Foliar – 0.8%	2.6 a	1.6 bc (73)	1.3 c (86)	16.6 a (28)	12.6 ab (63)	12.3 ab (56)	10.3 ab (53)
Celero 16WG (clothianadin)	Drench – 6.3 oz	1.3 a	0.7 bc (77)	1.6 c (65)	5.5 bc (52)	8.4 bc (51)	4.7 bc (66)	7.0 abc (36)
Distance (pyriproxifen)	Foliar – 8 fl oz	1.9 a	1.5 bc (66)	3.0 bc (56)	10.4 abc (38)	9.6 bc (62)	12.3 ab (40)	7.8 abc (51)
Judo (spiromesifen)	Foliar – 4 fl oz	1.2 a	1.6 bc (42)	2.0 bc (53)	4.6 c (57)	8.4 bc (47)	5.3 bc (59)	5.7 bc (44)
Marathon II (imidacloprid)	Drench – 5.4 fl oz	1.2 a	0.5 c (82)	1.9 bc (56)	6.2 bc (41)	4.0 bc (75)	5.7 bc (56)	4.8 bc (53)
MilStop	Foliar – 2.5 lb	2.3 a	1.9 b (64)	2.8 bc (66)	7.5 abc (63)	7.7 bc (75)	10.9 ab (56)	8.7 ab (55)
Safari 25WG (dinotefuran)	Drench – 24 oz	1.9 a	0.4 c (91)	0.9 c (87)	1.6 c (90)	1.2 c (95)	1.0 c (95)	0.5 c (97)
Check		1.6 a	3.7 a (0)	5.7 a (0)	14.1 ab (0)	21.1 a (0)	17.2 a (0)	13.5 a (0)

Table 38. Efficacy of foliar and drench applications for uncaged Q Biotype Whiteflies on Poinsettia 'Dynasty Red', Oetting 2005a ^z.

^z At the start of the experiment, Q was 100% of the population according to esterase assay (Dr. Frank Byrne).

^y Population counted on three leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Oetting 2005b. Foliar applications of Botanigard, Flagship, Naturalis B, Orthene + Tame, and TriStar + Capsil were applied to Poinsettia 'Dynasty Red' (Table 39 - p48). Whitefly adults were allowed to migrate among treatments. 100% of the population was Q biotype. Foliar applications of Beauveria bassiana products were applied 4 times at 4 to 5 day intervals, while the rest of the products were applied two times 13 days apart. The immature populations prior to treatment ranged between 7.9 and 21.1 on three leaves, and the adult populations averaged between 2.4 and 4.9 on the same three leaves.

In this research, good knockdown of immatures was observed after the first and second sprays but there was some difference in population levels among the treatments on week two (Table 40 - p49). There was also a good knockdown after the second application in most treatments. The best overall performance was in the TriStar and *Beauveria bassiana* treatments. TriStar provided between 76 and 97% control of adults, while the *Beauveria bassiana* treatments provided excellent control initially. Starting at 21 DAT, TriStar provided 98% control or better for immatures, BotaniGard provided, 96% or better. While Flagship and Orthene/Tame provided 80 to 92% control other treatments would have to be rotated into the management program.

 Table 39. * Efficacy of foliar applications for uncaged Bemisia Q Biotype Whiteflies on Poinsettia

 'Dynasty Red' – Application Dates, Oetting 2005b.

Treatment (Active Ingredient)	Application Method –		Applicat	tion Date	S
	Rate per 100 gal	11/9	11/14	11/18	11/22
BotaniGard (Beauveria bassiana)	Foliar – 64 fl oz	Х	Х	Х	Х
Flagship 25WG (thiamethoxam)	Foliar – 3 oz	Х			Х
Naturalis B	Foliar – 64 fl oz	Х	Х	Х	Х
Orthene 97S+ Tame (acephate + fenpropathrin)	Foliar -5.33 oz $+12$ fl oz	Х			Х
TriStar 70WSP + Capsil (acetamiprid)	Foliar 2.25 + 6.0 fl oz	X			Х
Check					

* Not an IR-4 sponsored experiment.

Treatment (A stive	Application		Population Co	ounts, Means Sej	parations, and	Henderson's I	Percent Contro	Z
I reatment (Active	Method – Rate	Precount	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT
Ingreulent)	per 100 gal	11/9	11/16	11/23	11/30	12/7	12/14	12/21
	-	-	Immat	tures	-	-		
BotaniGard (Beauveria bassiana)	Foliar – 64 fl oz	16.4 bc	2.4 cd (77)	0.7 bcd (97)	0.9 cd (98)	1.8 b (96)	0.9 abc (99)	6.4 bc (96)
Flagship 25WG (thiamethoxam)	Foliar – 3 oz	21.1 bc	9.7 a (26)	22.4 abc (30)	5.1 ab (92)	6.5 b (89)	42.9 ab (81)	24.6 bcd (88)
Naturalis B	Foliar – 64 fl oz	12.8 abc	7.1 ab (11)	2.8 bcd (86)	3.5 cd (90)	4.4 b (88)	3.6 cde (97)	0.0 cde (100)
Orthene 97S + Tame (acephate + fenpropathrin)	Foliar – 5.33 oz + 12 fl oz	19.5 abc	12.3 cd (0)	14.0 ab (52)	6.9 bc (88)	11.4 b (80)	19.3 bcde (91)	20.1 bc (89)
TriStar 70WSP + Capsil (acetamiprid)	Foliar 2.25 + 6.0 fl oz	7.9 c	2.1 bcd (57)	2.4 bcd (80)	0.5 bc (98)	0.0 b (100)	0.6 de (99)	0.0 cde (100)
Check		9.6 c	6.0 a (0)	14.5 a (0)	27.3 a (0)	28.0 a (0)	101.8 a (0)	93.3 a (0)
		-	Adu	lts	-	-	-	
BotaniGard (Beauveria bassiana)	Foliar – 64 fl oz	2.4 a	0.1 d (97)	0.5 cd (91)	4.9 ab (0)	14.5 a (0)	17.6 a (0)	13.9 bcd (33)
Flagship 25WG (thiamethoxam)	Foliar – 3 oz	2.5 a	2.9 bcd (28)	4.4 b (24)	7.6 a (0)	13.5 a (0)	20.0 a (0)	20.3 ab (6)
Naturalis B	Foliar – 64 fl oz	3.5 a	0.1 d (98)	0.0 d (100)	0.0 c (100)	4.1 bc (66)	7.0 bc (50)	7.0 cd (77)
Orthene 97S + Tame (acephate + fenpropathrin)	Foliar – 5.33 oz + 12 fl oz	4.9 a	2.0 bcd (74)	3.0 bc (74)	3.8 abc (45)	7.9 ab (53)	11.0 ab (44)	6.4 cd (85)
TriStar 70WSP + Capsil (acetamiprid)	Foliar 2.25 + 6.0 fl oz	3.8 a	1.0 cd (84)	2.1 bcd (76)	0.6 bc (89)	0.4 c (97)	4.1 bc (73)	1.5 d (95)
Check		3.5 a	5.6 a (0)	8.1 a (0)	4.9 ab (0)	11.9 a (0)	14.1 ab (0)	30.3 a (0)

Table 40. * Efficacy of foliar applications for uncaged Bemisia Q Biotype Whiteflies on Poinsettia 'Dynasty Red', Oetting 2005b.

* Not an IR-4 sponsored experiment. ^z Population counted on three leaves.

^y All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Gilrein 2006a. Foliar applications were made of biologically- and chemically- based products to Poinsettia 'Orion Red' and whitefly adults were allowed to migrate freely among treatments (Table **41** - p50). At the start of the experiment the population was 8% B biotype and 92% Q biotype Foliar applications BotaniGard 22WP, M-Pede, Ornazin, Revoke, and Sucrocide were made 4 times at 7 day intervals. Applications of BotaniGard ES were made once. Judo and Safari were applied twice at a 14 day interval. Eco E-rase was applied 3 times at 7 day intervals. The immature populations prior to treatment ranged between 121.5 and 178.4 on eight leaves.

The most effective treatments in this trial included Safari 20SG at both tested rates (85 to 96% control at 17 and 21 DAT), M-Pede (>96%) and Judo 4SC at both rates (82 to 92%) (Table 42 - p51). Eco-Erase was also very effective, but the treatment was dropped from the trial following a problem with the irrigation system that caused substantial wilting. Revoke and Sucrocide were moderately effective and both formulations of BotaniGard showed some suppression. The BotaniGard ES formulation was eliminated from the trial due to noticeable phytotoxicity after the second application. Ornazin was not effective at the tested rate.

Treatment (Active	Application Method –		Application Dates				
Ingredient)	Rate / 100 gal	4/21	4/28	5/5	5/12		
BotaniGard 22WP (Beauveria bassiana)	Foliar - 2 lb	Х	X	Х	X		
BotaniGard ES (Beauveria bassiana)	Foliar - 2 qt	Х					
Eco E-rase (jojoba oil)	Foliar - 1 gal	Х	Х	Х			
Judo 4SC (spiromesifen)	Foliar - 2 fl oz	Х		Х			
Judo 4SC (spiromesifen)	Foliar - 4 fl oz	Х		Х			
M-Pede (potassium salts of fatty acids)	Foliar - 2 gal	Х	X	Х	X		
Ornazin 3%EC()	Foliar - 10 fl oz	Х	Х	Х	Х		
Revoke ()	Foliar - 2 gal/1 gal	Х	Х	Х	Х		
Safari 20SG (dinotefuran)	Foliar - 4 oz	Х		Х			
Safari 20SG (dinotefuran)	Foliar - 8 oz	Х		Х			
Sucrocide /Sucrocide	Foliar - 1 gal per 0.5 gal / Foliar - 0.5 per 0.5 gal	Х	Х	Х	Х		
Water spray		Х		Х			

Table 41. Efficacy of foliar applications for immature uncaged Bemisia B And Q Biotype Whiteflies on Poinsettia 'Orion Red' – Application Rates and Dates, Gilrein, 2006a.

Treatment (Active	Popula	tion Counts, Mean	s Separations, an	d Henderson's	erson's % Control ^y					
Ingredient)	0 DAT	5 DAT * 4/26	10 DAT * 5/3	17 DAT * 5/10	24 DAT * 5/17					
BotaniGard 22WP	178.4 a ^x	111.0 bcd (52)	83.3 cd (62)	87.9 e (74)	141.8 d (74)					
BotaniGard ES	128.3 a	109.1 bcde (34)								
Eco E-rase	134.1 a	104.6 bcd (40)	30.8 a (81)							
Judo 4SC (spiromesifen) - 2 fl oz	133.8 a	76.9 abc (56)	52.5 abc (68)	46.5 cd (82)	41.4 b (90)					
Judo 4SC (spiromesifen) - 4 fl oz	149.0 a	62.6 ab (68)	53.0 abc (71)	34.9 bc (88)	35.3 b (92)					
M-Pede (potassium salts of fatty acids)	140.4 a	39.9 a (78)	32.1 a (82)	10.6 a (96)	13.4 a (97)					
Ornazin 3%EC	149.8 a	161.1 e (17)	209.3 f (0)	236.9 f (16)	382.9 e (16)					
Revoke	163.5 a	71.8 ab (66)	91.5 d (55)	94.6 e (69)	74.8 c (85)					
Safari 20SG (dinotefuran) - 4 oz	141.6 a	121.5 cde (34)	60.8 bcd (65)	38.9 bc (85)	21.8 ab (95)					
Safari 20SG (dinotefuran) - 8 oz	121.5 a	82.3 bc (48)	35.5 ab (76)	21.0 ab (91)	13.1 a (96)					
Sucrocide	164.0 a	97.8 bcd (54)	87.5 d (57)	74.8 de (76)	94.8 cd (81)					
Water spray	126.5 a	164.0 e (0)	156.8 e (0)	238.1 f (0)	384.1 e (0)					

Table 42. Efficacy of foliar applications for immature uncaged Bemisia B And Q Biotype Whiteflies on Poinsettia 'Orion Red', Gilrein, 2006a^z.

^z At the start of the experiment, B was 8% and Q was 92% of the population according to esterase assay (Dr. Frank Byrne).

^y Populations counted on 8 fully expanded leaves.

^x Means within columns followed by the same letter are not significantly different at p=0.05 (Fisher's LSD). *Data were transformed prior to analysis using sq(y).

Gilrein 2006b. Foliar applications were made of biologically- and chemically- based products to Poinsettia 'Orion Red' and whitefly adults were allowed to migrate freely among treatments (Table 43 - p52). All drenches were applied once. The foliar applications were applied 3 times at approximately 7 day intervals with the exception of Sorbitol Octanoate and Organocide which were applied once and then dropped from the experiment due to phytotoxicity. The immature populations prior to treatment ranged between 229.5 and 300.6 on half of eight leaves.

Flagship drenches as tested in this trial were generally ineffective for controlling Q biotype whiteflies (Table 44 - p53). Flagship sprays were more effective, providing moderate or better control especially at the highest tested rate. Avid, M-Pede, Orthene + Tame, and BotaniGard ES, Eco E-Rase sprays and both Safari drenches all reduced whitefly populations to low or very low levels.

Treadenant (A stine In and isot)	Amplication Mathed Date (100 col		Applicat	ion Dates	8
Treatment (Active Ingredient)	Application Method – Rate / 100 gai	10/6	10/15	10/20	10/27
Avid 0.15 EC (abamectin)	Foliar – 8 fl oz	Х	Х	Х	
BotaniGard ES (Beauveria bassiana)	Foliar – 1 quart	X	X	X	
Eco E-rase (97.5% jojoba oil, IJO Products)	Foliar – 1 quart	X	X	Х	
Flagship 25WG (thiamethoxam)	Drench using 2 fl oz/pot – 4 fl oz	Х			
Flagship 25WG (thiamethoxam)	Drench using 4 fl oz/pot – 4 fl oz	Х			
Flagship 25WG (thiamethoxam)	Drench using 2 fl oz/pot – 5 fl oz	Х			
Flagship 25WG (thiamethoxam)	Drench using 2 fl oz/pot – 6 fl oz	Х			
Flagship 25WG (thiamethoxam)	Foliar – 4 fl oz	Х	Х	Х	
Flagship 25WG (thiamethoxam)	Foliar – 5 fl oz	Х	Х	Х	
Flagship 25WG (thiamethoxam)	Foliar – 6 fl oz	Х	Х	Х	
M-Pede 49% (49% potassium salts of fatty acids)	Foliar – 0.01%	Х	Х	Х	
Organocide (sesame seed oil)	Foliar – 1X	Х			
Orthene TTO 97S + Tame 2.4EC (acephate + fenpropathrin)	Foliar – 1/3lb + 10.67 fl oz	Х	X	Х	
Safari 20SG (dinotefuran)	Drench early using 200 ml / pot – 12 oz	Х			
Safari 20SG (dinotefuran)	Drench late using 200 ml / pot - 12 oz				Х
Sorbitol Octanoate	Foliar – 0.005%	Х			
Unsprayed control					

Table 43. * Efficacy of foliar applications for immature uncaged Bemisia B And Q Biotype Whiteflies on Poinsettia 'Orion Red' – Application Rates and Dates, Gilrein, 2006b ^z.

* Not an IR-4 sponsored experiment.

 Table 44. * Efficacy of foliar applications for immature uncaged Bemisia B And Q Biotype Whiteflies on Poinsettia 'Orion Red', Gilrein, 2006b.

	Population Counts, Means Separations, and Henderson's Percent Control ^z						
Treatment (Active Ingredient)	Precount 10/3	5 DAT ** 10/11	13 DAT ** 10/19	20 DAT *** 10/26	33 DAT *** 11/8	45 DAT ** 11/20	53 DAT ** 11/28
Avid 0.15 EC (abamectin)	229.5 a	129.6 b (46)	48.9 b (79)	23.3 ab (88)	45.0 a (81)		
BotaniGard ES (Beauveria bassiana)	278.6 a	188.6 c (35)	151.3 c (47)	43.1 bc (81)	80.5 abc (72)		
Eco E-rase (jojoba oil)	244.5 a	193.6 c (24)	98.9 c (60)	97.4 de (51)	128.6 cd (48)		
Flagship 25WG (thiamethoxam) – Drench (2 fl oz) – 4 fl oz	298.5 a	298.5 d (4)	289.1 d (5)	353.9 gh (0)	378.8 fg (0)		
Flagship 25WG (thiamethoxam) – Drench (4 fl oz) – 4 fl oz	254.3 a	300.5 d (0)	253.5 d (2)	328.0 gh (0)	342.1 fg (0)		
Flagship 25WG (thiamethoxam) – Drench (2 fl oz) – 5 fl oz	283.0 a	332.0 d (0)	319.5 d (0)	373.5 h (0)	322.9 ef (0)		
Flagship 25WG (thiamethoxam) – Drench (2 fl oz) – 6 fl oz	300.6 a	333.8 d (0)	323.4 d (0)	339.4 gh (0)	421.9 g (0)		
Flagship 25WG (thiamethoxam) – Foliar – 4 fl oz	274.9 a	201.3 c (29)	95.0 c (66)	110.8 e (51)	138.9 d (50)		
Flagship 25WG (thiamethoxam) Foliar – 5 fl oz	288.9 a	297.6 d (1)	109.3 c (63)	121.8 e (49)	124.8 bcd (57)		
Flagship 25WG (thiamethoxam) Foliar – 6 fl oz	285.6 a	192.4 c (35)	112.1 c (62)	66.1 cd (72)	82.8 ab (71)		
M-Pede 49% (potassium salts of fatty acids)	255.1 a	86.9 a (67)	30.3 a (88)	19.0 a (91)	93.1 bcd (64)		
Organocide	236.0 a						
Orthene TTO 97S + Tame 2.4EC (acephate + fenpropathrin)	256.9 a	198.1 c (26)	115.9 c (56)	63.9 cd (70)	125.1 bcd (52)		
Safari 20SG (dinotefuran) – Drench early	261.9 a	188.3 c (31)	94.6 c (65)	268.9 fg (0)	123.1 bcd (54)	14.8 a (97)	18.8 a (97)
Safari 20SG (dinotefuran) – Drench late	265.3 a	275.1 d (0)	289.1 d (0)	326.8 gh (0)	252.5 e (6)	134.5 b (69)	86.3 b (85)
Sorbitol Octanoate	239.6 a						
Unsprayed control	288.4 a	299.1 d (0)	294.6 d (0)	236.6 f (0)	292.8 ef (0)	472.9 c (0)	615.9 c (0)

* Not an IR-4 sponsored experiment.

^z Populations counted on 8 half fully expanded leaves.

^y Means within columns followed by the same letter are not significantly different at p=0.05 (Fisher's LSD). **Data were transformed prior to analysis ln(y). ***Data were transformed prior to analysis sqrt(y)

Oetting 2006a. In this experiment, Salvia was utilized as the host crop instead of poinsettia (Table 45 - p54). The single non-proprietary treatment examined was BugOil. The immature populations prior to treatment ranged between 10.8 and 22.2 on three leaves, and the adult populations averaged between 1.2 and 1.6 on the same three leaves. Foliar applications of BugOil provided initial control.

Table 45. * Efficacy of foliar BugOil applications for uncaged Bemisia B (25%) And Q (75%) Biotype Whiteflies on Salvia, Oetting 2006a. ^z

I ifa Staga	Treatment (Active	Population Counts, Means Separations, and Henderson's Percent Control ^y					
Life Stage	Method – Rate / 100 gal	0 DAT 3/28	7 DAT 4/4	14 DAT 4/11	21 DAT 4/18	28 DAT 4/15	
Immatures	BugOil Foliar – 256 fl oz	10.8 a ^x	0.8 b (94)	2.1 b (88)	3.8 b (80)	15.8 b (22)	
	Check	22.2 a	25.4 a (0)	37.0 a (0)	39.7 a (0)	41.6 a (0)	
Adults	BugOil Foliar – 256 fl oz	1.6 a	1.6 a (45)	1.9 a (53)	1.6 a (69)	2.9 a (64)	
	Check	1.2 a	2.2 a (0)	3.0 a (0)	3.9 a (0)	6.0 a (0)	

* Not an IR-4 sponsored experiment.

 $^{\rm z}$ BugOil was applied on 3/28 and 4/4.

^y Population counted on three leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Oetting 2006b. Drenches and foliar applications were applied to Poinsettia 'Eckespoint Prestige Red' and whitefly adults were allowed to migrate among treatments (Table 46 - p55). At the start of the experiment the population was 17% B biotype and 83% Q biotype, while at the end both B and Q were at 50%. Drenches of Acelepryn and Safari were applied once, while foliar applications of Pedestal and TriStar were applied two times 14 days apart, and foliar applications of BugOil and EcoTrol EC were applied three times at weekly intervals. The immature populations prior to treatment ranged between 8.0 and 20.6 counted on three leaves, and the adult populations averaged between 3.2 and 6.9 on the same three leaves.

All treatments, except for the Pedestal treatment, had populations that were significantly different from the check at 8 DAT (Table 47 - p56). By 15 DAT very good to excellent control (86 – 95%) was obtained with BugOil at the low rate, Safari and TriStar. By 22 DAT, all treatments provided excellent control (>98%), with the exception of Acelepryn (poor), EcoTrol EC (moderate), and Pedestal (poor). At the conclusion of the experiment the Acelepryn treatment was the least efficacious of the group after a constant increase in population over the duration of the trial.

Table 46. Efficacy of foliar and drench applications for uncaged Bemisia B and Q Biotype Whiteflies on Poinsettia 'Eckespoint Prestige Red' – Application Dates, Oetting 2006b.

Treatment (Active	Application Method	Арр	Application Dates			
Ingredient)	Rate per 100 gal	8/30	9/6	9/13		
Acelepryn	Drench – 6.47 fl oz	Х				
BugOil	Foliar – 128 fl oz	X	Х	Х		
BugOil	Foliar – 256 fl oz	X	Х	Х		
EcoTrol EC	Foliar – 10 fl oz	X	Х	Х		
DPX-HGW86	Drench – 12.94 fl oz	X				
DPX-HGW86	Drench – 6.47 fl oz	X				
DPX-HGW86	Drench – 9.7 fl oz	X				
Pedestal (novaluron)	Foliar – 10 fl oz	Х		Х		
Safari 20SG (dinotefuran)	Drench –12 oz	X				
TriStar 70WSP (acetamiprid)	Foliar – 2.75 oz	Х		Х		
Check						

Population Counts, Means Separations, and Henderson's Percent Control ^y Treatment **Application Method** 0 DAT **15 DAT 22 DAT 35 DAT 43 DAT** 8 DAT **29 DAT** (Active Ingredient) – Rate per 100 gal 8/30 9/6 9/13 9/20 9/27 10/4 10/11 **Immatures** Acelepryn Drench – 6.47 fl oz 12.1 a 2.1 b (55) 20.2 bcd (42) 21.9 bc (18) 29.0 ab (0) 62.7 b (27) 144.8 b (0) BugOil Foliar – 128 fl oz 8.0 a ^x 3.1 b (0) 1.1 d (95) 0.0 e (100) 0.2 d (99) 4.8 de (92) 25.2 de (68) Foliar – 256 fl oz 0.0 b (100) 29.7 bc (48) 0.4 e (99) 0.1 d (100) 5.7 de (96) 39.6 d (80) BugOil 20.0 a EcoTrol EC Foliar – 10 fl oz 5.4 b (32) 19.6 bcd (67) 17.4 bcd (62) 20.6 a 10.4 cd (76) 41.5 bc (72) 106.4 c (48) DPX-HGW86 Drench – 6.47 fl oz 25.0 a 1.9 b (80) 12.4 bcd (83) 9.6 cde (83) 19.1 bc (64) 27.2 cd (85) 78.1 c (68) 22.2 de (85) DPX-HGW86 Drench – 9.7 fl oz 15.1 a 2.7 b (54) 5.5 d (87) 0.2 e (99) 2.7 d (92) 2.1 de (98) DPX-HGW86 Drench – 12.94 fl oz 16.9 a 0.0 b (100) 9.8 bcd (80) 5.8 de (84) 0.8 d (98) 12.8 de (89) 25.2 de (85) Pedestal (novaluron) Foliar – 10 fl oz 13.4 a 21.5 a (0) 31.2 ab (19) 28.2 b (5) 13.7 cd (51) 53.1 b (45) 94.0 c (29) 9.3 ab (0) Safari 20SG (dinotefuran) 6.1 cd (88) 0.5 e (99) 3.3 e (98) Drench –12 oz 18.2 a 0.2 d (99) 1.0 e (99) TriStar 70WSP Foliar -2.75 oz 15.3 a 10.6 ab (0) 6.3 cd (86) 0.7 e (98) 0.2 d (99) 0.4 e (100) 7.5 cd (95) (acetamiprid) 41.4 a (0) Check 18.7 a 7.2 b (0) 53.5 a (0) 39.4 a (0) 133.6 a (0) 185.4 a (0) Adults 15.7 (58) Acelepryn Drench - 6.47 fl oz4.4 a 4.5 ab (44) 8.7 ab (49) 8.4 b (72) 9.1 b (59) 18.3 a (29) 11.7 cd (37) BugOil Foliar – 128 fl oz 3.2 a 2.1 cd (64) 1.1 c (91) 3.2 c (85) 6.0 c (63) 8.5 def (69) BugOil Foliar – 256 fl oz 5.7 a 1.3 d (87) 1.6 c (93) 2.9 c (93) 6.0 c (79) 8.3 ef (83) 13.2 c (60) EcoTrol EC Foliar – 10 fl oz 6.9 a 3.3 bc (74) 4.2 c (84) 9.1 b (81) 9.4 b (73) 13.5 bcd (77) 16.8 ab (58) DPX-HGW86 Drench – 6.47 fl oz 6.5 a 3.5 bc (70) 5.4 bc (79) 9.3 b (79) 9.5 b (71) 11.3 bcde (80) 14.6 bc (61) DPX-HGW86 Drench – 9.7 fl oz 7.6 a 2.0 cd (86) 3.8 c (87) 2.6 c (95) 4.5 cde (88) 5.7 f (91) 9.9 de (78) DPX-HGW86 Drench - 12.94 fl oz 4.5 a 3.4 bc (58) 3.6 c (79) 6.9 b (77) 5.1 cd (78) 9.1 cdef (76) 10.1 de (61) 8.4 b (77) 9.3 b (65) Pedestal (novaluron) Foliar – 10 fl oz 5.3 a 4.1 b (57) 8.9 ab (57) 14.1 bc (69) 17.0 ab (45) 2.3 e (90) Safari 20SG (dinotefuran) Drench –12 oz 4.6 a 1.9 cd (77) 1.4 c (92) 1.7 c (95) 2.6 b (93) 5.1 f (81) TriStar 70WSP 4.7 a 3.1 bc (64) 2.6 c (86) 1.4 c (96) 3.0 b (93) Foliar -2.75 oz 2.8 de (88) 7.6 ef (72) (acetamiprid) 3.3 a 6.0 a (0) 12.8 a (0) 22.4 a (0) 28.3 a (0) Check 16.7 a (0) 19.2 a (0)

Table 47. Efficacy of foliar and drench applications for uncaged Bemisia B and Q Biotype Whiteflies on Poinsettia 'Eckespoint Prestige Red', Oetting 2006b ^Z.

^z At the start of the experiment, B was 17% and Q was 83% of the population according to esterase assay (Dr. Frank Byrne). At the end of the experiment, both B and Q were at 50%.

^y Population counted on three leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Oetting 2006c. Foliar applications of biologically-based products were applied to Poinsettia 'Orion Red' and whitefly adults were allowed to migrate among treatments (Table 48 - p57). At the start of the experiment the population was 17% B biotype and 83% Q biotype, and at the end the population was 58% B biotype and 42% Q biotype. The foliar applications of BotaniGard and BotaniGard + TriCon were applied 4 times at approximately 5 d intervals; the QRD-400 and TriCon treatments were applied 3 times at 7 day intervals. The immature populations prior to treatment ranged between 14.3 and 19.5 counted on three leaves, and the adult populations averaged between 2.0 and 7.8 on the same three leaves.

In this experiment, the rate of BotaniGard was lowered in comparison to a previous experiment. While still reducing whitefly populations, the level of control was not as great, even with the addition of TriCon (Table 49). QRD400 at 1% provided moderate control of immatures (61 to 86%) and slight better control of adults (75 to 88%). TriCon alone performed poorly for immatures (46 to 56%) but reasonable well (76 to 88%) for adults. All three products may represent alternative choices for a balanced management program designed to reduce resistance to conventional products.

 Table 48. * Efficacy of foliar applications for uncaged Bemisia B and Q Biotype Whiteflies on

 Poinsettia 'Orion Red' – Application Dates, Oetting 2006c.

Treatment (Active	Application Mathad	Application Dates				
Ingredient)	Rate per 100 gal	9/13	9/20	9/25	9/27	9/30
BotaniGard	Foliar – 32 oz	Х	Х	Х		Х
BotaniGard + TriCon	Foliar $32 \text{ oz} + 50 \text{ oz}$	Х	Х	Х		Х
QRD 400	Foliar 0.5%	Х	Х		Х	
QRD 400	Foliar 1.0%	Х	Х		Х	
QRD 400 + Biotune	Foliar 1% + 0.2%	Х	Х		Х	
TriCon	Foliar 50 fl oz	Х	Х		Х	
Check						

Oetting 2006d. This experiment was designed to examine foliar applications of Avid tank mixed with pyrethroids and applications of several products where tolerance issues might exist with the introduced Q biotype populations (Table 50 - p58). Foliar applications were applied to Poinsettia 'Orion Red' and whitefly adults were allowed to migrate among treatments. At the start of the experiment the population was 17% B biotype and 83% Q biotype, while at the end both B and Q were 55% and 45% of the population, respectively. Single foliar applications of Avid, Avid + Scimitar, and Avid + Tame were applied on September 20. The other treatments had a single reapplication on October 4. The immature populations prior to treatment ranged between 17.5 and 34.2 counted on three leaves, and the adult populations averaged between 3.3 and 13.1 on the same three leaves.

None of the treatments provided particularly effective control until 28 DAT (Table 51 - p59). At this time the best treatment was Avid alone (91% control). At 35 and 42 DAT, Avid and Sanmite provided moderate to good control (78 – 88%). There was no indication that the pyrethroids Scimitar or Tame improved the efficacy of Avid; in fact, while the populations of the tank-mix combinations were statistically equivalent to Avid alone, when the percent control was calculated using Henderson's method the addition of pyrethroids lowered effective control in this experiment. The two pyrethroids seemed to have the least impact on the immature whitefly population with Dursban performing fairly similarly.

Treatment (Active	Application Mothed Date	Populatio	son's Percent					
Ingredient)	per 100 gal	0 DAT 9/13	7 DAT 9/20	14 DAT 9/27	21 DAT 10/4	28 DAT 10/11		
	Immatures							
BotaniGard	Foliar – 32 oz	14.3 a ^x	10.9 d (62)	3.8 c (87)	45.8 b (54)	97.2 ab (18)		
BotaniGard + TriCon	Foliar 32 oz + 50 oz	15.6 a	23.9 c (24)	14.9 bc (54)	40.1 b (63)	82.0 bc (37)		
QRD 400	Foliar 0.5%	14.5 a	29.7 bc (0)	19.5 b (35)	41.2 b (59)	67.8 bc (44)		
QRD 400	Foliar 1.0%	18.5 a	28.7 bc (23)	5.4 c (86)	34.9 b (73)	59.5 bc (61)		
QRD 400 + Biotune	Foliar 1% + 0.2%	19.5 a	36.6 ab (6)	25.7 ab (36)	47.2 b (65)	47.1 c (71)		
TriCon	Foliar 50 fl oz	16.3 a	42.4 a (0)	18.1 b (46)	67.0 b (41)	60.1 bc (56)		
Check		16.6 a	33.3 abc (0)	34.2 a (0)	115.1 a (0)	138.0 a (0)		
	-	A	dults	-	-	-		
BotaniGard	Foliar – 32 oz	3.0 bc	1.3 cd (78)	2.1 b (75)	6.1 b (66)	19.0 a (52)		
BotaniGard + TriCon	Foliar 32 oz + 50 oz	4.5 abc	0.9 d (90)	2.6 ab (79)	7.6 b (72)	16.8 a (72)		
QRD 400	Foliar 0.5%	5.7 ab	4.6 a (60)	6.5 a (59)	7.2 b (79)	25.1 a (67)		
QRD 400	Foliar 1.0%	7.7 a	2.6 abcd (83)	5.3 ab (75)	5.7 b (88)	22.4 a (78)		
QRD 400 + Biotune	Foliar 1% + 0.2%	7.3 a	2.0 bcd (86)	2.2 b (89)	7.0 b (84)	22.5 a (77)		
TriCon	Foliar 50 fl oz	7.8 a	3.2 abc (79)	5.1 ab (76)	5.5 b (88)	17.4 a (83)		
Check		2.0 c	4.0 ab (0)	5.5 ab (0)	11.9 a (0)	26.4 a (0)		

Table 49. * Efficacy of foliar applications for uncaged Bemisia B And Q Biotype Whiteflies on Poinsettia 'Orion Red', Oetting 2006c ^z.

^z At the start of the experiment, B was 17% and Q was 83% of the population according to esterase assay (Dr. Frank Byrne). At the end of the experiment, B was 58% and Q was 42% of the population.

^y Population counted on three leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Table 50.	Efficacy of fo	liar applications f	or uncaged	Bemisia E	B and Q	Biotype	Whiteflies on
Poinsettia	'Orion Red'	- Application Dat	tes, Oetting	2006d.			

Treatment (Active	Application Mathad	Applicati	cation Dates	
Ingredient)	Rate per 100 gal	9/20	10/4	
Avid (abamectin)	Foliar – 8 oz	Х		
Avid + Scimitar	Foliar - 8 oz + 5 oz	Х		
Avid + Tame	Foliar - 8 oz + 16 oz	Х		
Scimitar (cyhalothrin)	Foliar – 5 oz	Х	Х	
Tame (fenpropathrin)	Foliar – 16 oz	Х	Х	
Sanmite (pyribdaben)	Foliar – 6 oz	Х	Х	
Discus (imadacloprid + bifenthrin)	Foliar – 50 oz	X	Х	
Dursban (chlorpyrifos)	Foliar – 8 oz	Х	Х	
Check				

Treatment (A stive	Application Mathad	etion Method Population Counts, Means Separations, and Henderson's Percent Control ^y						у	
Ingredient)	– Rate per 100 gal	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	
0 ,	1 0	9/20	9/27	10/4	10/11	10/18	10/25	11/1	
	Immatures								
Avid (abamectin)	Foliar – 8 oz	37.1 a ^x	19.3 b (55)	24.1 c (64)	25.4 c (69)	30.4 c (91)	80.7 c (81)	154.6 b (88)	
Avid + Scimitar	Foliar $-8 \text{ oz} + 5 \text{ oz}$	26.8 abcd	16.5 b (47)	20.0 c (58)	29.8 c (50)	50.1 c (80)	101.0 c (67)		
Avid + Tame	Foliar $-8 \text{ oz} + 16 \text{ oz}$	33.0 abc	14.3 b (63)	26.8 c (55)	24.4 c (67)	51.4 c (83)	99.1 c (73)		
Scimitar (cyhalothrin)	Foliar – 5 oz	18.0 cd	21.0 b (0)	41.0 b (0)	57.3 b (0)	130.0 b (21)	239.0 b (0)		
Tame (fenpropathrin)	Foliar – 16 oz	33.4 a	35.4 a (8)	55.4 a (7)	54.0 b (27)	161.2 b (47)	356.3 a (6)		
Sanmite (pyribdaben)	Foliar – 6 oz	17.9 cd	12.0 b (42)	23.7 c (26)	24.7 c (38)	51.8 c (68)	44.3 c (78)	79.8 b (87)	
Discus (imadacloprid + bifenthrin)	Foliar – 50 oz	17.5 d	17.8 b (12)	14.9 c (52)	16.5 c (57)	38.4 c (76)	71.5 c (64)		
Dursban (chlorpyrifos)	Foliar – 8 oz	18.9 bcd	20.2 b (8)	40.8 b (0)	51.7 b (0)	121.4 b (30)	193.2 b (10)		
Check		34.2 a	39.6 a (0)	61.1 a (0)	75.6 a (0)	313.4 a (0)	386.4 a (0)	1,147.0 a (0)	
			Adu	ilts			-		
Avid (abamectin)	Foliar – 8 oz	5.4 bc	0.6 c (88)	2.8 d (86)	9.9 b (68)	35.8 bc (55)	63.3 bc (61)	24.2 b (81)	
Avid + Scimitar	Foliar $-8 \text{ oz} + 5 \text{ oz}$	4.9 bc	1.9 abc (57)	2.0 d (89)	10.0 b (64)	46.8 abc (35)	67.8 bc (54)		
Avid + Tame	Foliar $-8 \text{ oz} + 16 \text{ oz}$	3.3 c	1.6 bc (46)	3.6 bcd (70)	9.9 b (47)	29.3 c (39)	45.4 c (54)		
Scimitar (cyhalothrin)	Foliar – 5 oz	11.9 a	3.7 a (65)	6.3 bcd (86)	17.1 a (75)	65.7 a (62)	87.1 ab (76)		
Tame (fenpropathrin)	Foliar – 16 oz	13.1 a	2.6 abc (78)	7.4 bc (85)	22.0 a (70)	64.0 a (67)	89.8 ab (77)		
Sanmite (pyribdaben)	Foliar – 6 oz	7.7 abc	1.7 abc (75)	2.9 cd (90)	4.3 b (90)	29.1 c (74)	45.0 c (80)	31.3 b (83)	
Discus (imadacloprid + bifenthrin)	Foliar – 50 oz	11.3 a	2.0 abc (80)	5.0 bcd (88)	5.8 b (91)	34.8 bc (79)	55.5 bc (84)		
Dursban (chlorpyrifos)	Foliar – 8 oz	9.1 ab	2.7 ab (67)	7.5 b (78)	18.8 a (63)	60.3 a (55)	74.0 bc (73)		
Check		3.7 c	3.3 ab (0)	13.6 a (0)	20.9 a (0)	54.0 ab (0)	110.7 a (0)	87.3 a (0)	

Table 51. Efficacy of foliar applications for uncaged Bemisia B and Q Biotype Whiteflies on Poinsettia 'Orion Red', Oetting 2006d ^Z.

² At the start of the experiment, B was 17% and Q was 83% of the population according to esterase assay (Dr. Frank Byrne). At the end of the experiment, B was 55% and Q was 45% of the population.

^y Population counted on three leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Oetting 2007a. The objective of this experiment was to examine several potential management programs and their impact on resistance (Table 52 - p61). Poinsettia 'Prestige' plants were caged with 25 whitefly adults at the start of the experiment; in other words, whitefly adults were not allowed to migrate among treatments. At the start and end of this research, 100% of the population was Q biotype. An initial application of Safari was compared with Marathon, the standard initial drench. Both of these treatments were to be followed up with foliar applications of rotational products designed to minimize resistance. However, the initial treatment of Safari completely control whitefly populations so that no foliar treatment was necessary. The last application regime was to treat as if a grower missed the window for drenching and had to rescue the crop. See Table 20 for the application dates and rates. The immature populations prior to treatment ranged between 41.9 and 62.4 on two leaves, and the adult populations averaged between 7.5 and 14.4 on the same two leaves.

As mentioned above, excellent control was obtained with the dinotefuran treatments (>92% control 14 DAT with 100% control at 28 DAT) and repeat applications were not necessary (Table 53 - p62). The standard imidacloprid drench, mistakenly applied at a 2X rate, did not completely eliminate whitefly adults or immatures even when followed by two foliar applications of Marathon. The IPM treatment where Judo was not applied until 14 days after the drench treatments did not perform well. The population was extremely high by the time of application (185.9 immatures and 9.6 adults per 2 leaves) and it took several weeks to reach 89% control. The followup Avid treatments did enable this treatment to reach 100% control at 2 weeks after the first Avid application. This was a disappointing result for Judo because earlier research demonstrated a much faster reduction of whitefly populations. However, the initial population prior to treatment was quite high, and growers would never let the population reach this level before starting applications.

Oetting 2007b. This experiment was designed to examine several potential management programs under conditions where reinfestation could occur (Table 54 - p63). Foliar and drench applications were made to poinsettia 'Prestige' and whitefly adults were allowed to migrate among treatments. At the start and end of this research, 100% of the population was Q biotype. An initial application of Safari was compared with Marathon, the standard initial drench. Both of these treatments were to be followed up with foliar applications of rotational products designed to minimize resistance. However, the initial treatment of Safari completely control whitefly populations so that no foliar treatment was necessary. Initial foliar applications of Celero, Flagship, and Tristar with followup applications of Sanmite were compared. A standard foliar application of Orthene + Tame with followup applications of Avid was included. The last application regime was to treat as if a grower missed the window for drenching and had to rescue the crop. See Table 22 for the application dates and rates. The immature populations prior to treatment ranged between 25.0 and 129.6 on two leaves, and the adult populations averaged between 9.8 and 71.0 on the same two leaves.

As previously mentioned, excellent control was obtained with the dinotefuran treatments (>93% control 14 DAT with 100% control at 28 DAT) and repeat applications were not necessary (Table 55 - p64). The standard imidacloprid drench, mistakenly applied at a 2X rate, performed quite poorly even when followed by two foliar applications of Marathon (0 – 72% control). The IPM treatment where Judo was not applied until 14 days after the drench treatments did not perform well. The population was extremely high by the time of application (372.4 immatures and 18.8 adults per 2 leaves) and it took several weeks to reach even 21% control. The followup Avid treatments did enable this treatment to reach 83 – 93% control. Two consecutive foliar applications of Celero and Flagship also did not perform as well as anticipated given the high population levels, and the followup Sanmite treatments were not able to effectively reduce immature or adult populations. Two consecutive foliar applications of TriStar were able to provide moderate control (76 – 84%), but the followup Sanmite treatments started to break with the heavy population pressure. The standard Orthene + Tame foliar applications did not provide control,

but the followup Avid treatments did provide moderate control 1 week after each application (80% and then 73%). In previous research, most of the treatments performed reasonably well in controlling Q biotype whiteflies at low to medium population levels. This experiment clearly demonstrates that very few products can effectively manage out-of-control whitefly populations with constant heavy reinfestation.

Table 52. Efficacy of foliar applications for caged *Bemisia tabaci* Q Biotype Whiteflies on Poinsettia 'Prestige' – Application Rates and Dates, Oetting, 2007a.

Treatment	Application Method – Rate /		Application Dates				
(Active Ingredient) ^z	100 gal	3/20	4/3	4/17	5/1	5/15	
Judo (spiromesefin)	Foliar - 4 fl oz		Х	Х			
/ Avid (abamectin)	/ 8 fl oz				Х	Х	
Marathon II (imadacloprid)	Drench – 3.4 fl oz per 1000 pots	Х					
/ Marathon II (imidacloprid)	/ 1.7 fl oz per 100 gal				Х	Х	
Safari 20SG (dinotefuran)	Drench – 12 oz	Х					
Safari 20SG (dinotefuran)	Drench – 12 oz	Х					
Safari 20SG (dinotefuran)	Drench – 12 oz	Х					
Check							

^z The '/' represents rotational treatments while the '+' represents tank-mixed treatments.

The start (A start			Popula	tion Count	s, Means S	eparations	, and Hende	erson's % C	ontrol y	<u></u>		
I reatment (Active	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	49 DAT	56 DAT	63 DAT	70 DAT	
ingreatent)	3/20	3/27	4/3	4/10	4/17	4/24	5/1	5/8	5/15	5/22	5/29	
Immatures												
Judo (spiromesefin) /	62.4 a	150.8 a	185.0 0	142.6 b	79.8 b	62.5 b	19.9 bc	9.9 b	1.8 b	6.4 b	0.0 b	
Avid (abamectin)	02.4 a	130.8 a	165.9 a	(34)	(57)	(75)	(89)	(96)	(100)	(99)	(100)	
Marathon II (imadcloprid)		1179a	47.6 h	19.0 c	54 c	12.5 c	30.6 h	18.6 h	18.6 h	35.9 h	14.1 h	
/Marathon II	61.4 a	(32)	(82)	(91)	(97)	(95)	(83)	(92)	(97)	(94)	(93)	
(imidacloprid)		(32)	(02)	()1)	()/)	()))	(05)	()2)	(51)	(21)	(55)	
Safari 20SG (dinotefuran)	53 6 a	52.8 b	11.4 b	4.5 c	1.3 c	0.5 c	0.0 c	0.0 b	0.0 b	0.0 b	0.0 b	
	55.0 u	(65)	(95)	(98)	(99)	(100)	(100)	(100)	(100)	(100)	(100)	
Safari 20SG (dinotefuran)	41.9 a	37.5 b	15.0 b	3.5 c	0.1 c	0.1 c	0.0 c	0.0 b	0.0 b	0.0 b	0.0 b	
	+1.7 α	(68)	(92)	(98)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	
Safari 20SG (dinotefuran)	55.5 a	73.9 b	19.3 b	16.3 c	1.9 c	0.0 c	0.0 c	0.0 b	0.0 b	0.0 b	0.0 b	
	0010 4	(53)	(92)	(92)	(99)	(100)	(100)	(100)	(100)	(100)	(100)	
Check	53.0 a	150.1 a	229.6 a	184.8 a	158.8 a	216.4 a	156.1 a	196.0 a	588.4 a	557.0 a	184.3 a	
		(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	
	•	•			Adults	1	•	•				
Judo (spiromesefin) /	14 4 a	7 5 a	96a	25.0 b	27.6 b	11.4 b	6.4 b	2.8 b	0.4 b	0.3 b	0.0 b	
Avid (abamectin)	11.14	7.5 u	9.0 u	(51)	(66)	(88)	(82)	(90)	(99)	(100)	(100)	
Marathon II (imadcloprid)		04 c	2.0 bc	64 c	89c	7.0 bc	2.4 hc	09b	19h	19b	11b	
/Marathon II	10.6 ab	(93)	(76)	(83)	(85)	(90)	(91)	(96)	(96)	(98)	(95)	
(imidacloprid)		(, , ,	()	(00)	(00)	(, ,	((, ,	(, ,	(, ,	(, , ,	
Safari 20SG (dinotefuran)	14.0 a	0.5 c	0.6 c	0.4 cd	0.1 c	0.6 bc	0.0 c	0.0 b	0.0 b	0.0 b	0.0 b	
		(94)	(95)	(99)	(100)	(99)	(100)	(100)	(100)	(100)	(100)	
Safari 20SG (dinotefuran)	7.6 b	0.3 c	0.3 c	0.0 b	0.1 c	0.0 c	0.0 c	0.0 b	0.3 b	0.0 b	0.0 b	
		(93)	(95)	(100)	(100)	(100)	(100)	(100)	(99)	(100)	(100)	
Safari 20SG (dinotefuran)	7.5 b	0.4 c	0.4 c	0.3 b	0.1 c	0.0 c	0.0 c	0.0 b	0.0 b	0.0 b	0.0 b	
	/	(91)	(93)	(99)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	
Check	8 8 ab	5.0 b	6.9 ab	31.5 a	49.8 a	57.3 a	21.8 a	17.4 a	39.3 a	65.5 a	17.1 a	
Check	0.0 40	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	

Table 53. Efficacy of foliar applications for caged *Bemisia tabaci* Q Biotype Whiteflies on Poinsettia 'Prestige', Oetting, 2007a ^z.

^z At the start and end of the experiment, Q was 100% of the population according to esterase assay (Dr. Frank Byrne). ^y Populations counted on 2 fully expanded leaves.

* All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Table 54. Efficacy of foliar applications for uncaged *Bemisia tabaci* Q Biotype Whiteflies on Poinsettia 'Prestige' – Application Rates and Dates, Oetting, 2007b.

Tweetment (Active Ingradient) &	Application Method – Rate /			Appli	cation D	ates		
reatment (Active ingredient)	100 gal	3/20	4/3	4/10	4/17	4/24	5/1	5/15
Celero 16WSG (clothianadin)	Foliar – 4 oz	Х	Х					
/ Sanmite (pyribdaben)	/ Foliar – 4 oz						Х	Х
Flagship 25WG (thiamethoxam)	Foliar – 4 oz	Х	X					
/ Sanmite (pyribdaben)	/ Foliar – 4 oz						Х	Х
Judo (spiromesefin)	Foliar - 4 fl oz per 100 gal		X		Х			
/ Avid (abamectin)	/ 8 fl oz per 100 gal						Х	Х
Marathon Drench	Drench – 5.4 fl oz per 1000 pots	Х						
/ Marathon Foliar	/ Foliar – 1.7 fl oz		Х	Х				
/ Avid (abamectin)	/ Foliar – 8 oz					Х		X
Orthene 97 TTO (acephate) + Tame 24 EC (fenpropathrin)	Foliar - 8.0 oz + 12.0 fl oz	Х	Х					
/ Avid (abamectin)	/ Foliar – 8 fl oz						Х	X
Safari 20SG (dinotefuran)	Drench – 12 oz	Х						
Safari 20SG (dinotefuran)	Drench – 12 oz	Х						
Safari 20SG (dinotefuran)	Drench – 12 oz	Х						
Tristar 30SG (acetamiprid)	Foliar – 4 oz	Х	X					
/ Sanmite (pyribdaben)	/ Foliar – 4 oz						Х	X
Check								

^z The '/' represents rotational treatments while the '+' represents tank-mixed treatments.

			Popul	ation Cour	nts, Means	Separation	s, and Hende	rson's % (Control ^y			
Treatment (Active Ingredient)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	49 DAT	56 DAT	63 DAT	70 DAT	
_	3/20	3/27	4/3	4/10	4/17	4/24	5/1	5/8	5/15	5/22	5/29	
Immatures												
Celero 16WSG (clothianadin)	44.0.1	60.4 b	112.8 b	31.6 c	104.8 b	165.2 bc	210.0 ab	77.4 b	138.4 b	144.4 bc	205.8 b	
/ Sanmite (pyribdaben)	44.0 bc	(51)	(39)	(79)	(25)	(3)	(0)	(40)	(15)	(8)	(0)	
Flagship 25WG (thiamethoxam)	25.0 -	38.4 b	46.8 b	39.0 c	77.8 b	76.4 c	83.0 abc	56.6 b	82.6 bc	134.2 bcd	112.2 cd	
/ Sanmite (pyribdaben)	23.0 C	(45)	(56)	(55)	(2)	(21)	(0)	(23)	(11)	(0)	(0)	
Judo (spiromesefin)	87.8 ab	236.2 0	372 4 0	600.8 a	294.6 a	363.6 a	202.4 ab	44.0 b	21.6 c	50.2 de	47.2 de	
/ Avid (abamectin)	07.0 aU	230.2 a	372.4 a	(0)	(0)	(0)	(21)	(83)	(93)	(84)	(85)	
Marathon Drench		134.0 ab	150.6 h	324.8 h	312.0.9	360 / ab	271.6 a	69.6 h	137.8 h	158.2 h	$145.4 \rm bc$	
/ Marathon Foliar	83.6 ab	(43)	(57)	(0)	(0)	(0)	(0)	(72)	(56)	(47)	(52)	
/ Avid (abamectin)		(15)	(37)	(0)	(0)	(0)	(0)	(12)	(50)	(17)	(52)	
Orthene 97 TTO (acephate) +		219.6 a	311.2 a	107.4 c	126.6 b	111.8 c	124.6 abc	47.4 b	94.6 bc	74.8 bcde	91.2 cd	
Tame 24 EC (fenpropathrin)	79.0 ab	(1)	(7)	(61)	(49)	(63)	(46)	(80)	(68)	(73)	(68)	
/ Avid (abamectin)		()				()		(()		()	
Safari 20SG (dinotefuran)	116.4 a	126.0 ab	33.0 b	14.6 c	2.4 b	13.4 c	0.6 c	0.0 b	6.4 c	0.0 e	0.0 e	
· · · · · · · · · · · · · · · · · · ·		(61)	(93)	(96)	(99)	(97)	(100)	(100)	(99)	(100)	(100)	
Safari 20SG (dinotefuran)	129.6 a	93.0 b	40.6 b	2.0 c	0.8 b	13.4 c	8.8 c	0.0 b	0.0 c	0.0 e	0.0 e	
· · · · · · · · · · · · · · · · · · ·		(74)	(93)	(100)	(100)	(97)	(98)	(100)	(100)	(100)	(100)	
Safari 20SG (dinotefuran)	94.6 ab	54.0 b	16.0 b	7.6 c	0.2 b	7.8 c	0.0 c	0.0 b	2.4 c	0.0 e	0.0 e	
		(80)	(96)	(98)	(100)	(98)	(100)	(100)	(99)	(100)	(100)	
Tristar 30SG (acetamiprid)	49.0 bc	55.4 b	32.6 b	32.0 c	29.0 b	45.6 c	33.0 bc	17.2 b	80.4 bc	57.0 cde	105.2 cd	
/ Sanmite (pyribdaben)		(60)	(84)	(81)	(81)	(76)	(77)	(88)	(56)	(67)	(41)	
Check	88.4 ab	247.2 a	374.0 a	308.6 b	279.4 a	341.8 ab	258.0 a	260.0 a	328.6 a	314.2 a	321.2 a	
	<u> </u>	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	
	1			A	dults							
Celero 16WSG (clothianadin)	17.8 c	18.6 bcd	9.6 bc	16.6 bc	18.4 ab	18.6 bc	23.0 a (0)	6.4 bc	19.6 a	20.0 b	28.4 b	
/ Sanmite (pyribdaben)		(34)	(61)	(46)	(19)	(55)		(69)	(0)	(34)	(23)	
Flagship 25WG (thiamethoxam)	9.8 c	15.0	17.2 ab	11.8 cd	17.6 ab	17.4 bc	17.4 ab	6.6 bc	7.0 bcd	8.4 cd	12.2 c	
/ Sanmite (pyribdaben)		bcde (4)	(0)	(30)	(0)	(24)	(0)	(41)	(0)	(50)	(40)	
Judo (spiromesefin)	68.6 a	37.2 a	18.8 ab	24.8 ab	17.0 ab	22.8 bc	14.2 ab	11.2 b	11.0 bc	8.0 cd	9.0 cd	
/ Avid (abamectin)				(79)	(81)	(86)	(83)	(86)	(73)	(93)	(94)	
Marathon Drench		24.2 abc	18.4 ab	18.2 bc	19.2 ab	29.6 ab	22.0 a	10.4 b	7.6 bcd	10.0 c	12.6 c	
/ Marathon Foliar	33.8 bc	(55)	(61)	(69)	(56)	(62)	(46)	(73)	(62)	(83)	(82)	
/ Avid (abamectin)		(00)	(01)	(0))	(00)	(0=)	()	(, 2)	(0=)	(00)	(0=)	

Table 55. Efficacy of foliar applications for uncaged *Bemisia tabaci* Q Biotype Whiteflies on Poinsettia 'Prestige', Oetting, 2007b ^z.

	Population Counts, Means Separations, and Henderson's % Control ^y											
Treatment (Active Ingredient)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	49 DAT	56 DAT	63 DAT	70 DAT	
	3/20	3/27	4/3	4/10	4/17	4/24	5/1	5/8	5/15	5/22	5/29	
Orthene 97 TTO (acephate) + Tame 24 EC (fenpropathrin) / Avid (abamectin)	21.0 c	4.6 de (86)	6.2 c (79)	9.2 cde (75)	19.8 ab (26)	22.2 bc (54)	14.0 ab (45)	7.4 bc (69)	12.6 ab (0)	8.0 cd (78)	9.8 cd (77)	
Safari 208C (dinatafuran)	71.0 a	$1.2 \circ (00)$	1.6 c	1.4 e	1.2 c	1.8 d	0.0 c	0.2 c	1.6 d	1.6 d	2.4 d	
Salari 2000 (dinotertalari)	/1.0 a	1.2 C ()))	(98)	(99)	(99)	(99)	(100)	(100)	(96)	(99)	(98)	
Safari 208G (dinotafuran)	53 () ab	$20 \circ (98)$	1.4 c	0.2 e	0.4 c	1.0 d	0.4 c	0.2 c	0.8 d	1.6 d	1.8 d	
Salari 2050 (unioterurali)	55.0 au	2.0 € (98)	(98)	(100)	(99)	(99)	(99)	(100)	(97)	(98)	(98)	
Safari 208G (dinotafuran)	32.2 ha	$1.0 \circ (0.00)$	1.4 c	1.2 e	0.4 c	2.0 d	0.8 c	0.2 c	4.0 cd	1.0 d	1.4 d	
Salali 2050 (ulloterurali)	32.2 UC	1.0 € (98)	(97)	(98)	(99)	(97)	(98)	(99)	(79)	(98)	(98)	
Tristar 30SG (acetamiprid)	20.0 a	13.0 cde	9.6 bc	6.0 de	7.8 bc	11.4 cd	8.2 bc	5.6 bc	9.8 bc	7.4 cd	12.6 c	
/ Sanmite (pyribdaben)	20.0 C	(59)	(65)	(83)	(70)	(75)	(66)	(76)	(17)	(78)	(69)	
Chealt	18 c 29.6 ab	29.6 ab	25.8 a	32.0 a	23.8 a	43.2 a	22.6 a	21.4 a	11.0 bc	31.8 a	38.4 a	
Спеск	18.0 C	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	

² At the start and end of the experiment, Q was 100% of the population according to esterase assay (Dr. Frank Byrne).
 ^y Populations counted on 2 fully expanded leaves.
 ^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Oetting 2007c. Determining the impact of mycoinsecticides on Q biotype is critical to developing a comprehensive control program for this pest (Table 56 - p66). Two products were tested in this experiment: BotaniGard ES (*Beauveria bassiana*) and NoFly (*Paecilomyces fumosoroseous*). Both products were applied at weekly intervals for a total of 4 applications and NoFly was tested at 4 different concentrations. While there was a significant reduction in adults and immatures starting at 28 days after first application, the level of control would not be considered commercially acceptable for shipping (Table 57 - p66).

Table 56. Efficacy of mycoinsecticides for *Bemisia tabaci* Q Biotype Whiteflies on Poinsettia 'Freedom Red' – Application Rates and Dates, Oetting, 2007c.

Treatment	Application Method –	Application Dates							
(Active Ingredient)	Rate / 100 gal	3/27	4/3	4/10	4/17				
BotaniGard ES (Beauveria bassiana)	Foliar - 1 quart	Х	Х	Х	Х				
NoFly (Paecilomyces fumosoroseous)	Foliar - 7 oz	Х	Х	Х	Х				
NoFly (Paecilomyces fumosoroseous)	Foliar - 14 oz	Х	Х	Х	Х				
NoFly (Paecilomyces fumosoroseous)	Foliar - 28 oz	Х	Х	Х	Х				
NoFly (Paecilomyces fumosoroseous)	Foliar - 42 oz	Х	Х	Х	Х				
Check									

Table 57. Efficacy of mycoinsecticides for *Bemisia tabaci* Q Biotype Whiteflies on Poinsettia 'Freedom Red', Oetting, 2007c ^z.

Treatment		Population	Counts, Mean	s Separations,	and Henderso	n's % Contro	у							
(Poto)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT							
(Kate)	3/27	4/3	4/10	4/17	4/24	5/1	5/8							
	Immatures													
BotaniGard	121.7 a	104.8 b (58)	95.2 a (9)	81.7 a (34)	28.0 b (81)	23.5 c (89)	81.0 c (89)							
NoFly (7 oz)	149.5 a	115.7 b (62)	109.3 a (15)	66.7 a (56)	67.0 b (63)	68.3 bc (74)	274.7 bc (69)							
NoFly (14 oz)	140.7 a	115.2 b (60)	162.7 a (0)	132.0 a (8)	62.7 b (63)	78.3 bc (68)	257.7 bc (69)							
NoFly (28 oz)	117.3 a	194.8 ab (19)	132.8 a (0)	79.3 a (34)	86.3 b (38)	111.3 b (45)	309.3 b (55)							
NoFly (42 oz)	208.7 a	70.2 b (84)	63.2 a (65)	67.0 a (68)	70.7 b (72)	58.0 bc (84)	197.3 bc (84)							
Check	138.2 a	282.3 a (0)	119.2 a (0)	140.7 a (0)	165.3 a (0)	239.3 a (0)	818.0 a (0)							
			Ad	lults	-	-	-							
BotaniGard	9.2 a	18.3 a (63)	27.2 a (47)	24.0 a (64)	11.0 c (84)	5.2 c (87)	9.7 c (82)							
NoFly (7 oz)	7.8 a	24.7 a (41)	28.0 a (35)	27.2 a (51)	19.2 bc (66)	11.8 bc (65)	15.8 bc (66)							
NoFly (14 oz)	11.5 a	32.7 a (47)	30.3 a (52)	23.0 a (72)	32.0 ab (62)	10.0 c (80)	27.2 ab (60)							
NoFly (28 oz)	14.3 a	30.3 a (61)	24.8 a (69)	31.3 a (69)	18.7 bc (82)	10.2 c (84)	24.3 ab (71)							
NoFly (42 oz)	16.3 a	11.3 a (87)	15.3 a (83)	23.5 a (80)	22.7 bc (81)	21.2 ab (70)	16.3 bc (83)							
Check	5.3 a	28.5 a (0)	29.3 a (0)	38.0 a (0)	38.7 a (0)	23.2 a (0)	31.5 a (0)							

^z At the start and end of the experiment, Q was 100% of the population according to esterase assay (Dr. Frank Byrne).

^y Populations counted on 3 fully expanded leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Oetting 2007d. The objective of this experiment was to study potential resistance in the two compounds that have been the most effective in controlling the 'Q' strain of *Bemisia* (Table 58 - p67). Two experiments were conducted testing low rates of Judo and Safari; one was in cages and the other in an open greenhouse where whiteflies could migrate from treatment to treatment. The caged trial was

conducted between Mar 20 and May 29, 2007 to study efficacy of these two compounds. The result was near 100% mortality and no individuals were left in the Safari treatments to allow continued exposure to the same insecticide by a population (data not shown). The same treatments were then applied for poinsettias grown in the open greenhouse. Even at the low rate of Judo (2 oz) and Safari (3 oz) mortality was nearly 100% throughout the 8 week experiment (Table 59- p68).

Table 58. Development of tolerance to two products for uncaged Bemisia Q Biotype Whiteflies	s on
Poinsettia 'Prestige' – Application Dates, Oetting 2007d.	

Treatment (Active	Application Method – Rate per	Application Dates			
Ingredient)	100 gal	7/11	7/18		
Judo (spiromesifen)	Foliar – 2 oz		Х		
Judo (spiromesifen)	Foliar – 4 oz		Х		
Marathon (imidacloprid)	Drench – 1.7 fl oz per 1000 pots	Х			
Safari 20SG (dinotefuran)	Drench – 3 oz	Х			
Safari 20SG (dinotefuran)	Drench – 6 oz	Х			
Untreated					

	Population Counts, Means Separations, and Henderson's Percent Control ^y										
Treatment (Rate)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	51 DAT	58 DAT		
	7/11	7/18	7/25	8/1	8/8	8/15	8/22	8/30	9/6		
				Immatur	es						
Judo (2 oz)		3.7 a	8.6 a (52)	13.0 b (55)	10.9 b (80)	1.8 c (90)	0.4 c (98)	0.5 bc (96)	0.8 c (99)		
Judo (4 oz)		1.3 a	2.5 b (60)	8.9 b (12)	3.6 b (81)	0.6 c (91)	0.3 c (96)	0.0 c (100)	1.0 c (95)		
Marathon	4.8 a	2.1 a (0)	2.4 b (49)	7.4 b (2)	7.0 b (51)	5.9 b (0)	3.4 b (32)	1.3 b (56)	13.3 b (7)		
Safari (3 oz)	9.6 a	1.6 a (17)	1.1 b (88)	0.8 c (95)	0.2 b (99)	0.0 c (100)	0.0 c (100)	0.0 c (100)	0.6 c (98)		
Safari (6 oz)	8.0 a	2.2 a (0)	1.6 b (80)	0.7 c (94)	0.1 b (100)	0.0 c (100)	0.0 c (100)	0.0 c (100)	0.0 c (100)		
Untreated	12.9 a	2.6 a (0)	12.6 a (0)	20.3 a (0)	38.3 a (0)	13.3 a (0)	13.4 a (0)	8.0 a (0)	38.5 a (0)		
				Adults							
Judo (2 oz)		2.3 a	0.6 a (1)	0.1 b (83)	1.9 a (40)	0.6 bc (72)	0.4 bc (88)	0.1 c (95)	0.0 b (100)		
Judo (4 oz)		1.0 ab	0.1 a (62)	0.1 b (62)	0.4 b (71)	0.6 bc (37)	0.1 c (93)	0.0 c (100)	0.1 b (90)		
Marathon	1.3 a	0.9 ab (38)	0.3 a (22)	0.1 b (74)	0.5 b (75)	1.3 ab (6)	0.9 b (56)	0.8 b (35)	0.5 b (66)		
Safari (3 oz)	1.1 a	0.2 b (84)	0.1 a (69)	0.0 b (100)	0.0 b (100)	0.0 c (100)	0.2 c (89)	0.1 c (90)	0.0 b (100)		
Safari (6 oz)	1.4 a	0.3 b (81)	0.0 a (100)	0.1 b (76)	0.0 b (100)	0.0 c (100)	0.0 c (100)	0.0 c (100)	0.0 b (100)		
Untreated	1.7 a	1.9 a (0)	0.5 a (0)	0.5 a (0)	2.6 a (0)	1.8 a (0)	2.7 a (0)	1.6 a (0)	1.9 a (0)		

Table 59. Development of tolerance to two products for Bemisia Q Biotype Whiteflies on Poinsettia 'Prestige', Oetting 2007d^Z

^z At the start of the experiment, Q was 100% of the population according to esterase assay (Dr. Frank Byrne).

^y Population counted on two leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Oetting 2007e. This research was planned to continue to screen neonicotinoids and new compounds on their efficacy for Q Biotype whitefly as single foliar and/or drench applications (Table 60 - p69). Whitefly adults were allowed to migrate among treatments. Five neonicotinoids were tested (Celero, Flagship, Marathon, Safari and TriStar). The other products were Acelepryn, Aria, Judo, and Kontos. The initial date of application varied for the products depending upon application method.

Efficacy varied among the products (Table 61 - p70). Acelepryn either as foliar or drench provided some suppression of immature whiteflies but little control for the adult stage. Aria provided excellent control of immatures starting at 35 DAT and good control of adults. Judo exhibited good to excellent control of immatures but only the 4 oz rate provided some suppression of adults, while the only rate of Kontos applied was similar to Judo at 4 oz per 100 gal. Among the neonicotinoids, Safari provided the best control with activity greater than 90% starting at 21 DAT and lasting through 58 DAT. Celero, Flagship and Marathon exhibited similar impact on immature whiteflies with peak efficacy at 35 DAT, but Celero and Flagship had no impact on adults while Marathon did suppress them. TriStar had excellent control of immatures starting at 28 DAT and lasting throughout the experiment; TriStar also demonstrated some suppression of adults.

Treatment (A stive Ingredient)	Application Method – Rate per	Applicat	ion Dates
Treatment (Active Ingredient)	100 gal	7/11	7/18
Acelepryn (chlorantraniliprole)	Foliar – 2 fl oz		Х
Acelepryn (chlorantraniliprole)	Drench – 6.7 fl oz	Х	
Aria (flonicamid)	Foliar – 120 g		Х
Celero 16WSG (clothianidin)	Foliar – 4 oz		Х
Flagship 25WG (thiamethoxam)	Foliar – 4 oz		Х
Judo (spiromesifen)	Foliar – 2 oz		Х
Judo (spiromesifen)	Foliar – 4 oz		Х
Kontos (spirotetramat)	Foliar – 3.4 oz		Х
Marathon (imidacloprid)	Drench – 1.7 fl oz per 1000 pots	Х	
Safari 20SG (dinotefuran)	Drench – 3 oz	Х	
Safari 20SG (dinotefuran)	Drench – 6 oz	Х	
TriStar	Foliar – 96 g		Х
Untreated			

 Table 60. Efficacy Screen for uncaged Bemisia Q Biotype Whiteflies on Poinsettia 'Prestige' –

 Application Dates, Oetting 2007e.

		Population Counts, Means Separations, and Henderson's Percent Control ^y										
Treatment (Rate)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	51 DAT	58 DAT			
	7/11	7/18	7/25	8/1	8/8	8/15	8/22	8/30	9/6			
	1	1	1	Imma	tures			T				
Acelepryn (F 2 oz)		61.9 cd	83.0 a (8)	42.7 ab (36)	141.4 a (46)	117.2 ab (72)	57.1 ab (54)	33.9 a (53)	44.8 b (57)			
Acelepryn (D 6.7 oz)	^x	54.8 cde	44.0 cde (45)	38.3 abc (35)	70.4 bc (70)	99.5 abc (73)	66.3 a (40)	41.8 a (35)	72.7 a (22)			
Aria		104.6 a	76.5 ab (50)	42.3 ab (62)	57.3 cd (87)	23.3 cd (97)	12.2 c (94)	1.1 de (99)	6.7 ef (96)			
Celero 16WSG		111.5 a	83.7 a (49)	47.7 a (60)	64.4 c (86)	39.5 bcd (95)	41.3 b (82)	12.6 cd (90)	27.3 bcd (86)			
Flagship 25WG		43.7 cdef	29.7 def (53)	17.0 cd (64)	27.9 cde (85)	16.4 cd (94)	9.8 c (89)	9.8 de (81)	22.9 cde (69)			
Judo (2 oz)		61.8 cd	50.3 bcd (44)	35.6 abc (46)	10.1 e (96)	11.0 cd (97)	8.7 c (93)	9.8 de (87)	19.0 cdef (82)			
Judo (4 oz)		72.7 bc	60.0 abc (44)	48.5 a (38)	57.1 cd (82)	12.4 cd (97)	10.3 c (93)	6.4 de (93)	15.9 def (87)			
Kontos		55.5 cde	27.0 def (67)	19.8 bcd (67)	11.8 de (95)	8.4 d (98)	6.7 c (94)	1.4 de (98)	4.1 ef (96)			
Marathon	38.8 a	34.8 def (36)	23.4 ef (71)	23.1 bcd (61)	25.0 cde (89)	17.3 cd (95)	16.4 c (85)	21.9 bc (66)	35.8 bc (62)			
Safari (3 oz)	29.2 a	14.7 f (64)	15.7 f (74)	1.1 d (98)	0.1 e (100)	0.6 d (100)	0.7 c (99)	0.0 e (100)	1.8 f (97)			
Safari (6 oz)	41.0 a	26.7 ef (54)	13.6 f (84)	0.2 d (100)	0.4 e (100)	0.0 d (100)	0.0 c (100)	0.0 e (100)	0.0 f (100)			
TriStar		92.5 ab	62.8 abc (54)	36.1 abc (64)	13.6 de (97)	11.6 cd (98)	12.4 c (93)	1.7 de (98)	9.6 def (94)			
Untreated	19.1 a	26.9 ef (0)	39.3 cdef (0)	28.9 abc (0)	114.6 ab (0)	181.9 a (0)	54.3 ab (0)	31.6 ab (0)	45.8 b (0)			
				Adı	ılts							
Acelepryn (F 2 oz)		6.1 ab	7.3 abc (8)	15.9 a (0)	12.3 a (24)	12.7 ab (32)	12.2 a (27)	25.9 a (11)	24.9 a (24)			
Acelepryn (D 6.7 oz)		6.0 ab	5.8 bcd (26)	14.0 ab (0)	9.9 ab (38)	15.0 a (19)	13.2 a (19)	19.3 b (32)	21.9 ab (32)			
Aria		9.2 a	6.9 abc (43)	10.4 bcd (22)	8.0 bc (67)	7.1 cde (75)	5.1 cde (80)	6.8 efg (84)	8.1 ef (84)			
Celero 16WSG		4.3 bc	11.1 a (0)	11.4 abc (0)	6.0 cde (48)	9.7 bcd (27)	10.8 ab (8)	15.9 bcd (22)	17.2 bcd (26)			
Flagship 25WG		2.0 cd	5.4 bcd (0)	4.9 efg (0)	5.1 def (4)	7.2 cde (0)	10.5 ab (0)	12.5 cde (0)	13.0 cde (0)			
Judo (2 oz)		6.5 ab	6.6 bc (22)	7.2 cde (23)	2.7 fg (84)	7.2 cde (64)	7.1 bcd (60)	11.7 cde (62)	12.6 cde (64)			
Judo (4 oz)		6.1 ab	9.0 ab (0)	9.7 bcde (0)	6.7 cd (59)	5.2 ef (72)	4.4 de (74)	9.7 def (67)	10.5 def (68)			
Kontos		6.3 ab	4.9 bcd (40)	4.9 efg (46)	5.0 def (70)	10.1 bcd (48)	4.7 de (73)	7.1 efg (76)	9.8 def (71)			
Marathon	3.6 a	4.8 bc (0)	3.5 cd (36)	5.3 ef (12)	3.5 ef (69)	6.2 de (52)	7.4 bcd (35)	14.1 bcd (29)	17.0 bcd (25)			
Safari (3 oz)	5.4 a	0.5 d (92)	1.4 d (83)	2.1 g (77)	0.7 g (96)	1.0 g (95)	3.6 de (79)	4.1 fg (86)	4.8 f (86)			
Safari (6 oz)	3.4 a	1.6 cd (59)	1.9 d (63)	0.4 g (93)	0.1 g (99)	1.4 fg (89)	1.0 e (91)	2.4 g (87)	4.4 f (79)			
TriStar	0.0	6.5 ab	4.8 bcd (43)	6.5 def (31)	4.1 def (76)	7.0 de (65)	9.5 abc (46)	7.7 efg (75)	9.9 def (72)			
Untreated	3.1 a	3.6 bcd (0)	4.7 bcd (0)	5.2 efg (0)	9.6 b (0)	11.1 abc (0)	9.8 ab (0)	17.1 bc (0)	19.4 abc (0)			

Table 61. Efficacy Screen for uncaged Bemisia Q Biotype Whiteflies on Poinsettia 'Prestige', Oetting 2007e^Z.

^z At the start of the experiment, Q was 100% of the population according to esterase assay (Dr. Frank Byrne).

^y Population counted on three leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

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Oetting 2007f. In order to develop good recommendations for growers utilizing all potential management tools, four biopesticides were examined BugOil, Met 52, Naturalis, NoFly (Table 62 - p71). Products were applied either at 3/5 or 7 day intervals, and two different rates of Met 52 and NoFly were tested. None of the products provided sufficient reduction in populations of immature whiteflies throughout most of the experiment (Table 63 - p71). Naturalis did provide marginally acceptable control by 28 DAT. However, Naturalis and NoFly did provide good levels of control while applications were occurring. After repeat applications ceased, control faded within 4 to 11 days after last application.

P	oinsettia 'Prestige Red' – Application Rates and Dates, Oetting, 2007f.											
Treatment (Treatment (Active Ingradient)	Application Method –	Application Dates									
	reatment (Active Ingredient)	Rate / 100 gal	10/3	10/7	10/10	10/14	10/17					
	Bug Oil	Foliar – 1 gal - 7d	Х		Х		Х					
	Met 52 (Metarhizium anisopliae F52)	Foliar – 15 oz - 3/5d	Х	Х	Х	Х						
	Met 52 (Metarhizium anisopliae F52)	Foliar – 15 oz - 7d	Х		Х		Х					
	Met 52 (Metarhizium anisopliae F52)	Foliar – 30 oz - 7d	Х		Х		Х					

Foliar - 64 oz - 3/5d

Foliar - 50 oz - 3/5d

Foliar – 50 oz - 7d

Foliar - 100 oz - 7d

Х

Х

Х

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 Table 62. Efficacy of foliar biopesticide applications for uncaged Bemisia Q Biotype Whiteflies on

 Poinsettia 'Prestige Red' – Application Rates and Dates, Oetting, 2007f.

Table 63. Efficacy of foliar biopesticide applications for uncaged Bemisia Q Biotype Whiteflies on Poinsettia 'Prestige Red', Oetting, 2007f.^z

	Population Counts, Means Separations, and Henderson's Percent Control ^z					
Treatment (Rate)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	
	10/3	10/10	10/17	10/24	10/31	
Immatures						
Bug Oil	20.0 a ^y	27.6 bc (0)	6.0 d (77)	17.5 bc (8)	19.4 ef (60)	
Met 52 (15 oz - 3/5d)	29.7 a	31.1 ab (16)	17.7 bc (54)	23.2 bc (18)	27.9 de (61)	
Met 52 (15 oz - 7d)	20.8 a	41.4 a (0)	23.1 b (15)	59.1 a (0)	58.7 ab (0)	
Met 52 (30 oz - 7d)	16.9 a	30.8 ab (0)	14.4 bcd (34)	31.8 b (0)	50.0 bc (0)	
Naturalis (64 oz - 3/5d)	16.6 a	15.1 d (27)	12.4 cd (42)	6.4 c (60)	7.7 f (81)	
NoFly (50 oz - 3/5d)	23.6 a	16.8 cd (43)	15.5 bcd (49)	72.4 a (0)	19.4 ef (66)	
NoFly (50 oz - 7d)	22.5 a	18.2 cd (35)	17.4 bc (40)	20.6 bc (4)	37.5 cd (31)	
NoFly (100 oz - 7d)	18.6 a	16.8 cd (27)	21.5 bc (11)	17.6 bc (1)	24.0 def (47)	
Check	28.1 a	35.0 ab (0)	36.5 a (0)	26.8 bc (0)	67.9 a (0)	
Adults						
Bug Oil	7.8 ab	3.2 bcd (79)	2.7 d (95)	36.8 abc (55)	24.7 bcd (40)	
Met 52 (15 oz - 3/5d)	7.8 ab	6.3 bc (59)	8.6 c (83)	23.2 c (72)	22.0 cd (47)	
Met 52 (15 oz - 7d)	10.8 a	14.2 a (33)	10.1 bc (85)	41.7 ab (63)	30.9 abc (46)	
Met 52 (30 oz - 7d)	7.6 abc	7.5 b (50)	14.9 ab (70)	51.8 a (35)	40.0 a (1)	
Naturalis (64 oz - 3/5d)	3.6 cd	1.0 d (86)	1.8 d (92)	4.4 d (88)	7.4 e (61)	
NoFly (50 oz - 3/5d)	8.9 ab	2.8 cd (84)	8.2 c (86)	45.1 ab (52)	30.9 abc (35)	
NoFly (50 oz - 7d)	9.6 ab	4.2 bcd (78)	11.0 bc (82)	25.5 c (75)	33.0 ab (35)	
NoFly (100 oz - 7d)	5.6 bcd	3.9 bcd (65)	10.1 bc (72)	20.9 c (65)	23.5 bcd (21)	
Check	2.8 d	5.5 bc (0)	18.0 a (0)	29.5 bc (0)	14.9 de (0)	

^z Population counted on three leaves.

Naturalis (Beauveria bassiana)

Control

NoFly (*Paecilomyces fumosoroseous*)

NoFly (*Paecilomyces fumosoroseous*)

NoFly (*Paecilomyces fumosoroseous*)

^y All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Oetting 2007g.

This research continued the efforts to develop tolerance in Judo and Safari 20SG at labeled and lower rates with the rationale if labeled rates provided nearly 100% control lower than label rates might allow for a higher survival and faster development of a tolerant population. Two foliar applications were made of Judo at 4 oz per 100 gal while single drench applications were made with Safari at rates ranging from 1.5 to 9 oz per 100 gal. The poinsettias and whiteflies were tested in cages.

Surprisingly, Q whitefly populations treated with Judo were not statistically different from the untreated control population throughout most of the experiment. Lack of activity from a potentially degraded sample product was ruled out in that a simultaneous experiment on B biotype whitefly demonstrated efficacy and that a fresh Judo sample applied on October 3 did not provide control (Table 65 - p73).

For Safari 20SG, a rate range impact was observed with the 1.5 oz rate enabling survival while the 6 and 9 oz rates achieved nearly 100% demise.

Treatment (Active	Application Method – Rate per	Application Dates	
Ingredient)	100 gal	9/19	10/3
Judo (spiromesifen)	Foliar – 4 oz	Х	Х
Safari 20SG (dinotefuran)	Drench – 1.5 oz	Х	
Safari 20SG (dinotefuran)	Drench – 3 oz	Х	
Safari 20SG (dinotefuran)	Drench – 6 oz	Х	
Safari 20SG (dinotefuran)	Drench – 9 oz	Х	
Untreated			

 Table 64. Development of tolerance to two products for caged Bemisia Q Biotype Whiteflies on

 Poinsettia 'Prestige' – Application Dates, Oetting 2007g.
Treatment	Population Counts, Means Separations, and Henderson's Percent Control ^y										
(Rate)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	49 DAT	56 DAT	73 DAT	80 DAT
(Nate)	9/19	9/26	10/3	10/10	10/17	10/24	10/31	11/7	11/14	11/21	11/28
					Imm	atures					
Judo (4 oz)	0.8 a ^x	26.9 a (0)	105.0 a (0)	109.4 a (0)	64.8 a (0)	45.1 ab (0)	31.1 b (0)	31.1 b (0)	62.5 a (0)	77.7 a (0)	104.6 a (0)
Safari (1.5 oz)	1.4 a	12.4 bc (13)	53.0 b (0)	75.8 ab (0)	55.1 a (0)	31.8 bc (16)	12.5 bc (75)	52.0 ab (0)	^v		
Safari (3 oz)	0.0 a ^w	7.4 c (68)	29.5 bc (9)	23.4 c (62)	19.0 b (68)	2.1 cd (97)	1.1 c (99)	7.6 c (86)			
Safari (6 oz)	0.0 a ^w	7.1 c (70)	6.6 c (80)	6.1 c (90)	2.3 b (96)	0.0 d (100)	0.0 c (100)	0.0 c (100)			
Safari (9 oz)	1.9 a	4.1 c (79)	13.5 c (49)	5.1 c (90)	1.3 b (97)	1.5 cd (97)	0.4 c (99)	0.0 c (100)			
Untreated	2.3 a	23.3 ab (0)	32.3 bc (0)	60.8 b (0)	59.5 a (0)	62.5 a (0)	83.5 a (0)	56.0 a (0)	91.5 a (0)	77.4 a (0)	91.5 a (0)
					Ad	lults					
Judo (4 oz)	12.1 a	7.4 b (66)	2.5 b (79)	11.6 b (35)	32.8 a (0)	29.1 a (0)	18.8 ab (0)	11.8 b (37)	8.8 a (50)	20.0 a (0)	21.4 a (0)
Safari (1.5 oz)	19.4 a	0.5 b (99)	0.8 b (96)	9.3 bc (67)	21.8 ab (0)	22.8 a (29)	10.6 bc (60)	19.8 a (34)			
Safari (3 oz)	20.6 a	0.0 b (100)	0.1 b (100)	2.0 cd (93)	3.5 c (80)	3.3 b (90)	2.6 cd (91)	2.8 c (91)			
Safari (6 oz)	13.0 a	0.1 b (100)	0.0 b (100)	0.3 d (98)	0.8 c (93)	0.1 b (100)	0.4 d (98)	1.3 c (94)			
Safari (9 oz)	23.0 a	0.3 b (99)	0.1 b (100)	1.1 cd (97)	0.1 c (99)	0.6 b (98)	0.4 d (99)	0.0 c (100)			
Untreated	14.4 a	25.8 a (0)	14.0 a (0)	21.1 a (0)	12.3 bc (0)	23.8 a (0)	19.9 a (0)	22.3 a (0)	21.1 a (0)	21.9 a (0)	20.9 a (0)

Table 65. Development of tolerance to two products for caged Bemisia Q Biotype Whiteflies on Poinsettia 'Prestige', Oetting 2007g^Z.

^z At the start of the experiment, Q was 100% of the population according to esterase assay (Dr. Frank Byrne).

^y Population counted on three leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

^w Percent control was calculated by the following formula for these treatments: 100*(Untreated-Treated)/Untreated

^v Data no longer collected on these treatments.

Oetting 2008ab. These two experiments were part of a series to determine the potential of *B. tabaci* Q biotype to develop tolerance to Judo and Safari. The two experiments were conducted simultaneously on two crops Penta 'Graffiti Violet' and Torenia 'Clown Violet' (Table 66 - p74; Table 68 - p75). Judo was tested on caged whiteflies at 4 and 8 fl oz per 100 gal; Safari 20SG was tested as a foliar application at 4 and 8 oz per 10 gal and as a drench at 8 and 12 oz per 100 gal. The foliar applications were applied twice at a 14 day interval. The drench applications were applied once.

As expected in the first experiment on Penta (Table 67 - p 75), the Marathon foliar application had little impact on either the adult or immature Q biotype populations. Only the drench applications of Safari provided 100% control of adults and immatures. Both rates of Judo and Safari foliar applications did have adult survivors, albeit in very low numbers.

In the second experiment on Torenia (Table 69 - p76), the whitefly populations were much lower -3.6 to 10.0 average immatures per 3 leaves on the untreated plants throughout the experiment. Even so a similar pattern emerged for Marathon and Judo. Marathon treatment had little impact on the adult or immature whiteflies. Judo provided 100% control of the immatures at the end of the experiment, but there were some adults surviving. The Safari applications exhibited a slightly different pattern of immature survivorship occurring with the lower rates, but the foliar applications provided 100% control of adult whiteflies.

Oetting 2008c. This research continued the long term research activities studying tolerance development with Judo and Safari. This experiment was conducted simultaneously to the previous two experiments on Salvia 'Vista Burgundy' in an open greenhouse where adult whiteflies could move from treatment to treatment (Table 70 - p76). Judo was tested on caged whiteflies at 4 and 8 fl oz per 100 gal; Safari 20SG was tested as a foliar application at 4 and 8 oz per 10 gal and as a drench at 8 and 12 oz per 100 gal. The foliar applications were applied twice at a 14 day interval. The drench applications were applied once.

The level of control was somewhat different in this experiment because the whitefly adults could move. Marathon appeared to provide some suppression of adults and immatures instead of having little impact (Table 71 - p77). Judo did provide excellent control of immatures at both tested rates, but there were more adults surviving at the lower rate by the end of the test. Safari drenches and foliar applications did not perform as well as in the companion caged experiments possibly due to constant movement of adults from the untreated plants. These adults may have laid eggs on plants with sublethal residues towards the latter part of the experiment.

Treatment	Application Method –	Application Dates		
(Active Ingredient)	Rate / 100 gal	3/12	3/26	
Judo (spiromesifen)	Foliar – 4 fl oz	Х	Х	
Judo (spiromesifen)	Foliar – 8 fl oz	Х	Х	
Marathon II (imidacloprid)	Foliar – 2 oz	Х	Х	
Safari 20SG (dinotefuran)	Foliar – 4 oz	Х	Х	
Safari 20SG (dinotefuran)	Foliar – 8 oz	Х	Х	
Safari 20SG (dinotefuran)	Drench – 8 oz	Х		
Safari 20SG (dinotefuran)	Drench – 12 oz	Х		
Check				

Table 66. Development of tolerance to certain insecticides with caged *Bemisia tabaci* Q Biotype Whiteflies on Penta 'Graffiti Violet' – Application Rates and Dates, Oetting, 2008a.

Tuestment	Population Counts, Means Separations, and Henderson's % Control ^z									
(Poto)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT			
(Nate)	3/20	3/27	4/3	4/10	4/17	4/24	4/31			
	Immatures									
Judo (4 oz)	17.8 a ^y	0.4 b (90)	4.3 ab (61)	0.3 b (99)	3.0 c (94)	3.5 c (93)	1.4 b (97)			
Judo (8 oz)	18.1 a	4.4 ab (0)	3.4 b (69)	0.0 b (100)	1.9 c (96)	0.0 c (100)	0.0 b (100)			
Marathon (2 oz)	10.3 a	5.3 a (0)	4.5 ab (29)	28.6 a (0)	22.5 b (16)	17.3 b (42)	44.5 a (0)			
Safari (F 4 oz)	14.5 a	0.3 b (90)	1.6 b (82)	0.0 b (100)	0.0 c (100)	0.6 c (99)	0.8 b (98)			
Safari (F 8 oz)	20.5 a	0.5 b (89)	0.5 b (96)	0.0 b (100)	0.0 c (100)	1.8 c (97)	0.4 b (99)			
Safari (D 8 oz)	13.4 a	0.8 b (72)	1.6 b (81)	0.0 b (100)	0.3 c (99)	0.5 c (99)	0.0 b (100)			
Safari (D 12 oz)	16.8 a	0.3 b (92)	0.3 b (97)	0.0 b (100)	0.0 c (100)	0.0 c (100)	0.0 b (100)			
Check	14.3 a	3.1 ab (0)	8.8 a (0)	17.0 a (0)	37.4 a (0)	41.6 a (0)	41.9 a (0)			
	-		Ad	ults	-	-				
Judo (4 oz)	18.6 a	11.4 b (66)	5.6 bc (64)	2.6 bc (84)	1.4 bc (89)	3.5 c (77)	2.1 b (89)			
Judo (8 oz)	23.3 a	10.9 bc (74)	4.4 cd (77)	4.5 b (78)	2.6 bc (84)	1.5 cd (92)	2.3 b (90)			
Marathon (2 oz)	16.1 a	31.4 a (0)	8.8 ab (35)	13.1 a (7)	4.3 b (62)	7.6 b (42)	14.8 a (11)			
Safari (F 4 oz)	27.9 a	1.6 cd (97)	0.6 de (97)	0.1 c (100)	0.1 c (99)	0.5 d (98)	0.9 b (97)			
Safari (F 8 oz)	18.9 a	0.3 d (99)	0.3 e (98)	0.0 c (100)	0.1 c (99)	0.4 d (97)	0.1 b (99)			
Safari (D 8 oz)	19.4 a	0.1 d (100)	0.0 e (100)	0.0 c (100)	0.3 c (98)	0.4 d (97)	0.0 b (100)			
Safari (D 12 oz)	27.0 a	0.3 d (99)	0.0 e (100)	0.0 c (100)	0.0 c (100)	0.1 d (100)	0.0 b (100)			
Check	12.9 a	23.5 a (0)	10.8 a (0)	11.3 a (0)	9.1 a (0)	10.5 a (0)	13.3 a (0)			

Table 67. Development of tolerance to certain insecticides with caged *Bemisia tabaci* Q Biotype Whiteflies on Penta 'Graffiti Violet', Oetting, 2008a.

^z Populations counted on 3 fully expanded leaves.

^y All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Table 68. Development of tolerance to certain insecticides with caged Bemisia tabaci Q Biotype
Whiteflies on Torenia 'Clown Violet' – Application Rates and Dates, Oetting, 2008b.

Treatment	Application Method –	Appli Da	cation ites
(Active Ingredient)	Kate / 100 gai	3/12	3/26
Judo (spiromesifen)	Foliar – 4 fl oz	Х	X
Judo (spiromesifen)	Foliar – 8 fl oz	Х	X
Marathon II (imidacloprid)	Foliar – 2 oz	Х	X
Safari 20SG (dinotefuran)	Foliar – 4 oz	Х	X
Safari 20SG (dinotefuran)	Foliar – 8 oz	Х	Х
Safari 20SG (dinotefuran)	Drench – 8 oz	Х	
Safari 20SG (dinotefuran)	Drench – 12 oz	X	
Check			

Tucotmont	Population Counts, Means Separations, and Henderson's % Control ^z							
(Poto)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT		
(Rate)	3/20	3/27	4/3	4/10	4/17	4/24		
			Immatures					
Judo (4 oz)	6.0 a ^y	0.0 c (100)	0.5 bc (91)	0.0 b (100)	0.9 b (95)	0.0 b (100)		
Judo (8 oz)	4.4 a	0.5 bc (82)	1.3 bc (68)	0.0 b (100)	2.1 b (84)	0.0 b (100)		
Marathon (2 oz)	1.4 a	1.5 ab (0)	2.1 ab (0)	6.5 a (0)	7.7 a (0)	11.6 a (0)		
Safari (F 4 oz)	2.0 a	0.1 c (92)	0.1 c (95)	0.0 b (100)	1.1 b (81)	2.0 b (64)		
Safari (F 8 oz)	1.6 a	0.0 c (100)	0.3 c (80)	0.0 b (100)	0.0 b (100)	0.0 b (100)		
Safari (D 8 oz)	2.6 a	0.1 c (94)	0.4 bc (83)	0.0 b (100)	0.3 b (96)	0.4 b (94)		
Safari (D 12 oz)	2.8 a	0.0 c (100)	0.0 c (100)	0.0 b (100)	0.0 b (100)	0.0 b (100)		
Check	3.6 a	2.3 a (0)	3.3 a (0)	7.0 a (0)	10.6 a (0)	10.0 a (0)		
			Adults					
Judo (4 oz)	6.3 ab	2.1 b (78)	2.4 bc (23)	1.1 b (77)	0.3 b (84)	1.0 b (68)		
Judo (8 oz)	5.5 abc	4.1 b (52)	0.9 c (67)	1.4 b (66)	0.0 b (100)	0.3 b (89)		
Marathon (2 oz)	5.4 abc	9.9 a (0)	9.4 a (0)	6.5 a (0)	1.8 a (0)	4.3 a (0)		
Safari (F 4 oz)	2.1 c	0.6 b (81)	0.1 c (90)	0.0 b (100)	0.0 b (100)	0.0 b (100)		
Safari (F 8 oz)	3.0 bc	0.1 b (98)	0.1 c (93)	0.0 b (100)	0.1 b (88)	0.0 b (100)		
Safari (D 8 oz)	2.6 bc	0.4 b (90)	0.0 c (100)	0.0 b (100)	0.0 b (100)	0.1 b (92)		
Safari (D 12 oz)	2.4 c	0.1 b (97)	0.1 c (92)	0.0 b (100)	0.0 b (100)	0.1 b (92)		
Check	8.3 a	12.8 a (0)	4.1 b (0)	6.3 a (0)	2.4 a (0)	4.1 a (0)		

Table 69. Development of tolerance to certain insecticides with caged *Bemisia tabaci* Q Biotype Whiteflies on Torenia 'Clown Violet', Oetting, 2008b.

^z Populations counted on 3 fully expanded leaves.

^y All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Treatment	Application Method –	Appli Da	cation ates	
(Active Ingreulent)	Kate / 100 gai	3/12	3/26	
Judo (spiromesifen)	Foliar – 4 fl oz	Х	Х	
Judo (spiromesifen)	Foliar – 8 fl oz	Х	Х	
Marathon II (imidacloprid)	Foliar – 2 oz	Х	Х	
Safari 20SG (dinotefuran)	Foliar – 4 oz	Х	Х	
Safari 20SG (dinotefuran)	Foliar – 8 oz	Х	Х	
Safari 20SG (dinotefuran)	Drench – 8 oz	Х		
Safari 20SG (dinotefuran)	Drench – 12 oz	X		
Check				

Table 70. Development of tolerance to certain insecticides with uncaged Bemisia tabaci Q Bioty	pe
Whiteflies on Salvia 'Vista Burgundy' – Application Rates and Dates, Oetting, 2008c.	

Tuestment	Population Counts, Means Separations, and Henderson's % Control ^z								
(Poto)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	49 DAT	
(Rate)	3/20	3/27	4/3	4/10	4/17	4/24	5/1	5/8	
	-	-	-	Immatures	-	-	-	-	
Judo (4 oz)	22.2 a	0.0 a (100)	11.4 b (84)	1.9 c (98)	0.2 b (100)	2.6 c (99)	0.0 c (100)	0.6 c (99)	
Judo (8 oz)	31.2 a	0.0 a (100)	14.3 b (86)	0.4 c (100)	0.0 b (100)	0.6 c (100)	0.2 c (100)	0.8 c (99)	
Marathon (2 oz)	23.7 a	0.0 a (100)	17.8 b (77)	86.3 b (36)	94.8 a (15)	118.1 b (36)	77.3 b (45)	46.6 b (58)	
Safari (F 4 oz)	16.9 a	0.0 a (100)	5.9 b (89)	7.2 c (93)	6.6 b (92)	31.7 c (76)	8.2 c (92)	12.1 c (85)	
Safari (F 8 oz)	19.2 a	0.3 a (0)	7.7 b (88)	1.7 c (98)	1.3 b (99)	4.7 c (97)	3.3 c (97)	12.2 c (86)	
Safari (D 8 oz)	28.0 a	0.0 a (100)	2.7 b (97)	0.0 c (100)	0.0 b (100)	0.2 c (100)	0.3 c (100)	0.8 c (99)	
Safari (D 12 oz)	18.2 a	0.0 a (100)	0.9 b (98)	0.0 c (100)	0.0 b (100)	0.0 c (100)	0.0 c (100)	2.8 c (97)	
Check	22.4 a	0.1 a (0)	71.9 a (0)	127.4 a (0)	105.3 a (0)	174.9 a (0)	133.1 a (0)	104.6 a (0)	
				Adults					
Judo (4 oz)	14.7 bc	5.7 c (66)	3.8 bc (58)	1.4 bc (83)	1.2 b (87)	1.8 c (92)	2.9 c (91)	4.9 bcd (74)	
Judo (8 oz)	28.8 a	4.0 cd (88)	5.4 ab (69)	1.9 bc (88)	1.4 b (92)	1.9 c (96)	3.0 c (95)	1.4 cd (96)	
Marathon (2 oz)	13.0 c	9.8 b (34)	6.4 ab (19)	2.4 b (66)	6.6 a (17)	8.7 b (56)	10.7 b (62)	8.6 b (48)	
Safari (F 4 oz)	12.1 c	2.1 de (85)	0.9 cd (88)	0.8 c (88)	0.8 b (89)	3.4 c (82)	3.4 c (87)	6.1 bc (60)	
Safari (F 8 oz)	20.7 b	1.8 de (92)	1.8 cd (86)	0.6 c (95)	0.3 b (98)	2.3 c (93)	2.9 c (93)	3.2 cd (88)	
Safari (D 8 oz)	13.5 c	1.0 e (94)	0.0 d (100)	0.8 c (89)	0.0 b (100)	0.0 c (100)	1.7 c (94)	1.2 d (93)	
Safari (D 12 oz)	14.4 bc	1.1 de (93)	0.1 d (99)	0.3 c (96)	0.1 b (99)	0.6 c (97)	1.2 c (96)	4.0 bcd (78)	
Check	11.3 c	13.0 a (0)	6.9 a (0)	6.2 a (0)	6.9 a (0)	17.3 a (0)	24.3 a (0)	14.3 a (0)	

 Table 71. Development of tolerance to certain insecticides with uncaged *Bemisia tabaci* Q Biotype Whiteflies on Salvia 'Vista Burgundy', Oetting, 2008c.

Oetting 2008d. This research continued the long term research activities studying tolerance development with Judo and Safari. This experiment was conducted on Salvia 'Queen Scarlet' in cages (Table 72 - p78). Treatments varied slightly from the previous set of experiments in that another Judo rate was added along with testing Kontos (spirotetramat), an active ingredient in the same chemical class as spiromesifen. No drench applications were made.

At the start of the experiment, populations were quite variable among the treatments due to using whiteflies from the previous caged studies (Table 73 - p79). The Marathon and untreated Check populations were statistically the same throughout. All other treatments were statistically lower than the untreated. Kontos, while not exhibiting good percent control using the Henderson's equation, did keep the immature and adult populations low through 35 DAT. Judo, Kontos, Marathon and Safari did have some adults survive at the end of the experiment.

Oetting 2008e. This experiment was the companion test to the previous experiment and was conducted on Salvia 'Queen Scarlet' in an open greenhouse where the whiteflies could move from treatment to treatment.

The population levels for both immatures and adults were relatively light in this test (Table 74 - p79). Marathon had little impact on immatures or adults. By 35 DAT Judo at all three rates exhibited 100% control of the immatures as did Safari at 8 oz per 100 gal. Kontos and the lower rate of Safari did provide good control. Adults survived in all treatments.

Treatment	Application Method –	Application Dates	
(Active Ingredient)	Rate / 100 gal	5/21	6/10
Judo (spiromesifen)	Foliar – 4 fl oz	Х	Х
Judo (spiromesifen)	Foliar – 8 fl oz	Х	Х
Judo (spiromesifen)	Foliar – 12 fl oz	Х	Х
Kontos (spirotetramat)	Foliar – 1.7 fl oz	Х	Х
Marathon II (imidacloprid)	Foliar – 2 oz	Х	Х
Safari 20SG (dinotefuran)	Foliar – 6 oz	Х	Х
Safari 20SG (dinotefuran)	Foliar – 8 oz	Х	X
Check			

 Table 72. Development of tolerance to certain insecticides with caged or uncaged *Bemisia tabaci* Q

 Biotype Whiteflies on Salvia 'Queen Scarlet' – Application Rates and Dates, Oetting, 2008de.

internes on Foreina Clown violet, Setting, 2000a.									
Treatment	Population Counts, Means Separations, and Henderson's % Control ^z								
(Dete)	0 DAT	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT			
(Kate)	5/21	5/28	6/3	6/10	6/17	6/24			
Immatures									
Judo (4 oz)	8.0 b	0.8 b (94)	1.5 b (81)	0.3 c (96)	0.0 b (100)	0.0 b (100)			
Judo (8 oz)	2.5 b	0.6 b (85)	0.0 b (100)	0.0 c (100)	0.0 b (100)	0.0 b (100)			
Judo (12 oz)	2.3 b	0.3 b (92)	0.0 b (100)	0.0 c (100)	0.0 b (100)	0.5 b (71)			
Kontos	1.5 b	4.1 b (0)	1.0 b (33)	0.9 c (31)	2.9 b (0)	1.3 b (0)			
Marathon II	35.4 a	52.6 a (8)	36.5 a (0)	22.1 b (28)	16.3 a (29)	24.6 a (6)			
Safari (6 oz)	5.9 b	4.6 b (52)	2.3 b (61)	5.3 c (0)	0.8 b (79)	0.8 b (82)			
Safari (8 oz)	2.8 b	0.4 b (91)	1.3 b (53)	1.5 c (39)	1.0 b (45)	0.1 b (95)			
Check	38.4 a	61.8 a (0)	38.0 a (0)	33.5 a (0)	25.0 a (0)	28.5 a (0)			
			Adults	-	-				
Judo (4 oz)	1.8 b	0.6 c (0)	0.5 c (0)	0.8 b (60)	0.1 c (94)	0.6 c (61)			
Judo (8 oz)	0.9 b	0.3 c (0)	0.5 c (0)	0.4 b (60)	0.6 c (32)	0.6 c (22)			
Judo (12 oz)	1.3 b	0.1 c (69)	0.3 c (0)	0.4 b (72)	0.3 c (76)	0.5 c (55)			
Kontos	0.8 b	1.4 bc (0)	0.4 c (0)	0.5 b (43)	0.0 c (100)	0.3 c (56)			
Marathon II	16.3 a	3.4 a (16)	3.1 a (0)	12.8 a (28)	23.4 a (0)	19.5 a (0)			
Safari (6 oz)	2.3 b	1.1 c (0)	1.1 bc (0)	2.9 b (0)	0.5 c (78)	0.9 c (54)			
Safari (8 oz)	1.5 b	0.4 c (0)	0.6 bc (0)	0.8 b (51)	0.5 c (66)	0.1 c (92)			
Check	13.3 a	3.3 ab (0)	1.9 ab (0)	14.6 a (0)	13.0 b (0)	11.3 b (0)			

Table 73. Development of tolerance to certain insecticides with caged *Bemisia tabaci* Q Biotype Whiteflies on Torenia 'Clown Violet', Oetting, 2008d.

^z Populations counted on 3 fully expanded leaves.

^y All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Table 74. Development of tolerance to certain insecticides with uncaged Bemisia tabaci Q Biot	type
Whiteflies on Salvia 'Queen Scarlet', Oetting, 2008e.	

Tuestreent	Population Counts, Means Separations, and Henderson's % Control						
(Poto)	0 DAT	T 7 DAT 14 DAT 21 DAT		28 DAT	35 DAT		
(Rate)	5/21	5/28	6/3	6/10	6/17	6/24	
			Immatures				
Judo (4 oz)	2.4 b	0.0 b (100)	0.4 bc (95)	0.8 c (93)	0.2 c (94)	0.0 b (100)	
Judo (8 oz)	2.5 b	0.0 b (100)	0.6 b (92)	0.1 c (99)	0.0 c (100)	0.0 b (100)	
Judo (12 oz)	2.8 ab	1.6 b (64)	4.6 bc (48)	2.6 c (80)	1.9 bc (49)	0.0 b (100)	
Kontos	1.9 b	0.0 b (100)	4.0 bc (34)	3.0 c (66)	1.7 bc (32)	0.2 b (92)	
Marathon II	1.1 b	1.3 b (25)	12.1 a (0)	14.4 b (0)	3.0 b (0)	6.1 a (0)	
Safari (6 oz)	3.6 ab	1.3 b (77)	5.5 b (52)	0.8 c (95)	2.7 b (43)	0.7 b (85)	
Safari (8 oz)	2.5 b	0.4 b (90)	0.2 c (97)	0.5 c (96)	1.2 bc (64)	0.0 b (100)	
Check	5.3 a	8.4 a (0)	16.9 a (0)	24.9 a (0)	7.0 a (0)	6.7 (0)	
	=	-	Adults	-	-	-	
Judo (4 oz)	1.6 a	0.3 c (70)	0.4 b (52)	0.1 e (97)	0.5 b (66)	0.5 c (71)	
Judo (8 oz)	2.0 a	0.5 bc (60)	0.5 ab (52)	0.5 de (89)	0.7 b (62)	1.7 bc (21)	
Judo (12 oz)	3.5 a	2.0 b (9)	1.2 ab (34)	1.9 cd (76)	0.5 b (85)	1.6 bc (57)	
Kontos	2.5 a	1.4 bc (11)	1.0 ab (23)	3.2 bc (44)	1.1 b (52)	1.0 c (63)	
Marathon II	2.3 a	1.8 bc (0)	1.4 a (0)	2.7 bc (49)	2.6 a (0)	3.6 a (0)	
Safari (6 oz)	3.0 a	6.4 a (0)	1.2 ab (23)	3.8 b (45)	0.7 b (75)	1.4 c (57)	
Safari (8 oz)	1.8 a	0.6 bc (47)	0.5 ab (46)	0.4 e (90)	0.2 b (88)	0.5 c (74)	
Check	2.7 a	1.7 bc (0)	1.4 a (0)	6.2 a (0)	2.5 a (0)	2.9 ab (0)	

^z Populations counted on 3 fully expanded leaves.

^y All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Oetting 2008f. This research was planned to continue to screen neonicotinoids and new compounds on their efficacy for Q Biotype whitefly as two foliar applications 15 days apart (Table 75 - p80). Four neonicotinoids were tested (Flagship, Marathon, Safari and TriStar). The other products were Aria, Avid, Judo, Kontos and Sanmite. The Q population was estimated to be higher than the B population

Efficacy varied among the products (Table 76 - p81). Acelepryn either as foliar or drench provided some suppression of immature whiteflies but little control for the adult stage. Aria provided excellent control of immatures starting at 35 DAT and good control of adults. Judo exhibited good to excellent control of immatures but only the 4 oz rate provided some suppression of adults, while the only rate of Kontos applied was similar to Judo at 4 oz per 100 gal. Among the neonicotinoids, Safari provided the best control with activity greater than 90% starting at 21 DAT and lasting through 58 DAT. Celero, Flagship and Marathon exhibited similar impact on immature whiteflies with peak efficacy at 35 DAT, but Celero and Flagship had no impact on adults while Marathon did suppress them. TriStar had excellent control of immatures starting at 28 DAT and lasting throughout the experiment; TriStar also demonstrated some suppression of adults.

Treatment (Active Ingredient)	Application Method – Boto per 100 col	Application Dates		
	Kate per 100 gar	9/9	9/24	
Aria (flonicamid)	Foliar – 4 oz	Х	Х	
Avid (abamectin)	Foliar –8 fl oz	Х	Х	
Flagship (thiamethoxam)	Foliar – 4 oz	Х	Х	
Judo (spiromesifen)	Foliar – 8 oz	Х	Х	
Kontos (spirotetramat)	Foliar – 1.7 fl oz	Х	Х	
Marathon (imidacloprid)	Foliar – 2 fl oz	Х	Х	
Safari (dinotefuran)	Foliar – 4 oz	Х	Х	
Sanmite (pyridaben)	Foliar – 6 oz	Х	Х	
TriStar (acetamiprid)	Foliar – 4 oz	X	X	
Check				

Table 75. Efficacy of foliar and drench applications for uncaged Bemisia B and Q Biotype Whiteflies on Poinsettia 'Eckespoint Advent Red' – Application Dates, Oetting 2008f.

Application Population Counts, Means Separations, and Henderson's Percent Control y Treatment Method – Rate per 0 DAT 22 DAT **43 DAT** 8 DAT **15 DAT 29 DAT 35 DAT** (Active Ingredient) 100 gal 8/30 9/6 9/13 9/20 9/27 10/4 10/11 **Immatures** Aria (flonicamid) Foliar – 4 oz 11.5 a ^x 10.6 b (77) 2.5 b (91) 8.2 b (74) 21.8 b (44) 24.7 b (64) 17.1 b (52) Avid (abamectin) Foliar –8 fl oz 3.8 b (90) 1.1 c (97) 5.8 cde (87) 10.1 cde (87) 13.6 a 5.8 b (89) 4.8 b (86) 4.4 c (89) Flagship (thiamethoxam) Foliar – 4 oz 12.8 a 12.7 b (75) 4.8 b (85) 4.1 b (88) 10.2 cd (76) 13.7 c (82) Judo (spiromesifen) Foliar – 8 oz 9.4 a 5.6 b (85) 1.9 b (92) 1.0 b (96) 0.3 c (99) 2.1 e (93) 2.7 f (95) 11.9 cd (86) Kontos (spirotetramat) Foliar – 1.7 fl oz 14.2 a 5.3 b (91) 2.4 b (93) 3.4 b (91) 2.4 c (95) 5.2 cde (89) Marathon (imidacloprid) Foliar -2 fl oz 24.5 b (58) 9.9 a 2.8 b (93) 2.7 b (89) 4.1 b (85) 10.0 bc (68) 12.0 c (64) Foliar – 4 oz 11.7 a 11.6 b (75) 0.4 b (99) 1.8 b (94) 0.3 c (99) 2.8 de (93) 3.5 ef (95) Safari (dinotefuran) Sanmite (pyridaben) Foliar – 6 oz 11.7 a 5.9 b (87) 2.5 b (92) 4.8 b (85) 4.2 cde (89) 5.7 def (92) 1.4 c (96) 0.3 c (99) TriStar (acetamiprid) $Foliar - 4 \ oz$ 15.3 a 9.9 b (84) 1.7 b (96) 1.8 b (96) 1.3 e (97) 2.1 f (98)

28.3 a (0)

1.8 abc (0)

0.3 cd (85)

1.4 abcd (43)

0.4 bcd (87)

1.7 abcd (76)

2.7 a (0)

0.1 d (95)

0.4 bcd (88)

0.5 bcd (91)

2.0 ab(0)

Adults

34.9 a (0)

1.3 cd (5)

1.1 cd (73)

1.8 bd (64)

1.0 cd (84)

1.3 cd (91)

2.9 ab (20)

0.0 d (100)

1.2 cd (82)

1.1 cd (90)

4.1 a (0)

30.4 a (0)

2.8 b (0)

1.5 b (72)

1.8 b (73)

1.4 b (83)

1.3 b (93)

1.7 b (65)

1.2 b (78)

1.2 b (87)

1.1 b (92)

5.4 a (0)

37.9 a (0)

2.6 b (0)

2.3 b (55)

2.0 b (68)

1.6 b (80)

1.9 b (90)

2.8 ab (38)

1.2 b (76)

1.6 b (81)

0.7 b (95)

5.1 a (0)

66.4 a (0)

2.8 bc (0)

2.2 c (73)

3.2 bc (68)

2.4 c (81)

2.9 bc (90)

4.7 b (35)

1.4 c (83)

2.2 c (84)

1.8 c (92)

8.1 a (0)

Table 76. Efficacy of foliar and drench applications for uncaged Bemisia B and Q Biotype Whiteflies on Poinsettia 'Eckespoint Advent Red', Oetting 2008f^Z.

^z At the start of the experiment, it was estimated that the Q population was higher than the B population.

Foliar – 4 oz

Foliar –8 fl oz

Foliar – 4 oz

Foliar – 8 oz

Foliar – 1.7 fl oz

Foliar -2 fl oz

Foliar – 4 oz

Foliar – 6 oz

Foliar - 4 oz

^y Population counted on three leaves.

Check

Check

Aria (flonicamid)

Avid (abamectin)

Judo (spiromesifen)

Safari (dinotefuran)

Sanmite (pyridaben)

TriStar (acetamiprid)

Kontos (spirotetramat)

Marathon (imidacloprid)

Flagship (thiamethoxam)

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

11.2 a

0.3 a

0.9 a

1.1 a

1.4 a

3.2 a

0.8 a

0.9 a

1.5 a

2.4 a

0.9 a

44.3 a (0)

1.3 a (0)

1.2 a (50)

1.5 a (49)

1.5 a (60)

1.7 a (80)

2.4 a (0)

0.2 a (92)

1.2 a (70)

1.2 a (81)

2.4 a(0)

Oetting 2008g. This experiment was initially designed to continue examining biopesticides on Q biotype, but B Biotype was shipped with the poinsettia plants. It was estimated that Q predominated at the beginning of the experiment, but by the end B was the dominant population. Three biopesticides were tested (Table 77 - p82)

All of the insecticides were successful in reducing the population of whiteflies (both adults and immatures) significantly below the water check at one time or another (Table 78 - p83). However, none of them were successful in reducing the population sufficiently to meet grower standards. *Beauveria* reduced the immature population to a consistently lower level than the other treatments, but it was not statistically significant. There was not any difference in the 3-4 days and the 7 day application schedule. The *M. anisopliae* and *P. fumosoroseus* treatments were not as good as *Beauveria* but were significantly less than the check. At the end of the trial the high rate of *P. fumosoroseus* was much less than the low rate and equal to the *Beauveria* treatments. The only treatments that reduced the adult whitefly population noticeably were the *Beauveria* and *P. fumosoroseus* high rate.

 Table 77. *Efficacy of foliar applications for uncaged Bemisia B and Q Biotype Whiteflies on

 Poinsettia 'Jacobsen PeterStar White' – Application Rates and Dates, Oetting, 2008g.

Treatment (Active Ingredient)	Application Method –	Application Dates				
reatment (Active ingredient)	Rate / 1 Liter	9/29	10/2	10/6	10/13	
Botanigard (Beauveria bassiana)	Foliar – 5 ml	Х	Х	Х		
Botanigard (Beauveria bassiana)	Foliar – 5 ml	Х		Х	Х	
Met 52 (Metarhizium anisopliae Strain F52)	Foliar – 1.7 ml	Х	Х	Х		
Met 52 (Metarhizium anisopliae Strain F52)	Foliar – 1.7 ml	Х		Х	Х	
NoFly (Paecilomyces fumosoroseus)	Foliar – 2 g	Х	Х	Х		
NoFly (Paecilomyces fumosoroseus)	Foliar – 2 g	Х		Х	Х	
NoFly (Paecilomyces fumosoroseus)	Foliar – 4 g	Х		Х	Х	
Control						

	Population Counts, Means Separations, and Henderson's Percent Control ^z								
Treatment (Rate)	0 DAT 11/1	7 DAT 11/8	14 DAT 11/15	21 DAT 11/22	28 DAT 11/29	35 DAT 12/6			
	Immatures								
Botanigard (5 ml 3-4 d)	47.6 a	102.1 a (43)	26.6 c (75)	97.7 bc (69)	112.6 d (70)	11.5 b (52)			
Botanigard (5 ml 7 d)	42.3 a	91.8 a (42)	31.8 bc (66)	92.4 c (67)	126.1 cd (62)	22.0 b (0)			
Met 52 (1.7 ml 3-4 d)	51.3 a	120.5 a (38)	44.1 bc (61)	187.4 ab (45)	203.7 bc (50)	15.2 b (42)			
Met 52 (1.7 ml 7 d)	35.2 a	86.8 a (35)	34.5 bc (55)	118.6 bc (49)	208.9 bc (25)	12.1 b (32)			
NoFly (2 g ml 3-4 d)	46.5 a	80.5 a (54)	49.9 b (51)	167.2 bc (46)	219.5 b (40)	15.2 b (36)			
NoFly (2 g ml 7 d)	41.3 a	74.7 a (52)	47.6 b (47)	137.0 bc (50)	232.0 ab (29)	12.4 b (41)			
NoFly (4 g ml 7 d)	31.9 a	35.8 a (70)	40.8 bc (42)	126.8 bc (40)	102.3 d (59)	36.7 a (0)			
Check	39.4 a	148.5 a (0)	86.4 a (0)	261.8 a (0)	309.8 a (0)	20.0 b (0)			
			Adults						
Botanigard (5 ml 3-4 d)	5.1 abc	10.8 a (0)	4.4 bc (31)	16.3 bc (0)	36.7 bc (0)	3.4 a (0)			
Botanigard (5 ml 7 d)	5.0 bc	11.9 a (0)	7.4 bc (0)	14.6 c (0)	28.2 c (2)	1.7 a (0)			
Met 52 (1.7 ml 3-4 d)	11.6 ab	6.9 a (48)	3.9 c (73)	25.3 abc (17)	50.5 ab (25)	2.1 a (0)			
Met 52 (1.7 ml 7 d)	3.5 c	12.3 a (0)	9.7 ab (0)	24.0 abc (0)	29.6 c (0)	1.8 a (0)			
NoFly (2 g ml 3-4 d)	8.8 abc	11.1 a (0)	8.2 abc (25)	29.6 a (0)	49.8 ab (2)	1.5 a (0)			
NoFly (2 g ml 7 d)	11.8 a	13.0 a (4)	6.1 bc (59)	20.4 abc (34)	61.6 a (10)	2.6 a (0)			
NoFly (4 g ml 7 d)	11.7 ab	11.0 a (18)	6.6 bc (55)	13.5 c (56)	22.6 c (67)	3.5 a (0)			
Check	10.9 ab	12.5 a (0)	13.6 a (0)	28.6 ab (0)	62.9 a (0)	1.1 a (0)			

Table 78. *Efficacy of foliar applications for uncaged Bemisia B and Q Biotype Whiteflies on Poinsettia 'Jacobsen PeterStar White', Oetting, 2008g.

^z Population counted on three leaves.

^y All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Gilrein 2009a. This experiment tested 2 neonicotinoid drenches (Marathon II, Safari 20SG) with 3 neonicotinoid foliar sprays (Marathon II, Safari 20SG, TriStar 30G). Another product tested for efficacy with foliar and drench applications was Kontos (Table 79 - p84). The best treatments in this experiment achieved control greater than 90% by 32 DAT (Table 80 - p84). Safari as drench and foliar treatments exhibited the highest levels of control. TriStar foliar applications performed similarly. Either foliar or drench applications of Kontos did provide excellent control with only the lowest drench rates not providing acceptable reductions. Marathon II provided suppression at best.

Treatment (A stive Ingredient)	Application Method – Rate per	Application Dates		
Treatment (Active Ingredient)	100 gal	May 27	6/11	
Kontos (spirotetramat)	Drench - 0.042ml/6 per pot	Х		
Kontos (spirotetramat)	Drench - 0.07ml/6 per pot	Х		
Kontos (spirotetramat)	Drench - 0.105ml/6 per pot	Х		
Kontos (spirotetramat)	Drench - 0.14ml/6 per pot	Х		
Marathon II (imidacloprid)	Drench - 0.07ml/6 per pot	Х		
Safari 20G (dinotefuron)	Drench - 0.213g/6 per pot	Х		
Kontos (spirotetramat)	Foliar - 1.7 oz/100 gal	Х	Х	
Kontos (spirotetramat)	Foliar - 2.5 oz/100 gal	Х	Х	
Kontos (spirotetramat)	Foliar - 3.4 oz/100 gal	Х	Х	
Marathon II (imidacloprid)	Foliar - 1.7 oz/100 gal	Х	Х	
Safari 20G (dinotefuron)	Foliar - 8 oz/100 gal	Х	Х	
Tristar 30G (acetamiprid)	Foliar - 5.3 oz/100 gal	X	Х	
Untreated				

Table 79. Efficacy Screen for Bemisia Q Biotype Whiteflies on Poinsettia 'Orion Red' – Application Dates, Gilrein 2009a.

Table 80	Efficacy Screen for	r Bemisia Q Biotype	Whiteflies on	Poinsettia	'Orion Red',	Gilrein
2009a*.						

Treatment (Active	Application Method – Bate per 100 gel	Number of Pupae on 8 half Leaves (Henderson's Percent Control) ^z					
ingredient)	Kate per 100 gai	Precount ^y	6 DAT	13 DAT	21 DAT		
Kontos (spirotetramat)	Drench - 0.042ml/6 per pot	155.1 a	212.3 ab (54)	181.6 bc (63)	213.6 ab (71)		
Kontos (spirotetramat)	Drench - 0.07ml/6 per pot	145.5 a	153.9 b (64)	144.8 bc (69)	120.5 bcd (83)		
Kontos (spirotetramat)	Drench - 0.105ml/6 per pot	134.4 a	158.6 b (60)	115.1 bcd (73)	45.4 cdef (93)		
Kontos (spirotetramat)	Drench - 0.14ml/6 per pot	138.8 a	187.6 ab (54)	99.4 bcd (78)	65.0 cde (90)		
Marathon II (imidacloprid)	Drench - 0.07ml/6 per pot	164.5 a	179.4 ab (63)	227.8 ab (57)	232.0 ab (71)		
Safari 20G (dinotefuron)	Drench - 0.213g/6 per pot	124.6 a	138.5 b (63)	79.4 cd (80)	11.3 g (98)		
Kontos (spirotetramat)	Foliar - 1.7 oz/100 gals	133.4 a	107.1 b (73)	82.3 cd (81)	45.8 def (93)		
Kontos (spirotetramat)	Foliar - 2.5 oz/100 gals	131.8 a	102.6 b (74)	93.6 cd (78)	37.8 efg (94)		
Kontos (spirotetramat)	Foliar - 3.4 oz/100 gals	140.9 a	133.9 b (68)	101.8 bcd (77)	36.4 cdef (95)		
Marathon II (imidacloprid)	Foliar - 1.7 oz/100 gals	133.0 a	216.8 ab (45)	175.9 abc (59)	121.8 bc (81)		
Safari 20G (dinotefuron)	Foliar - 8 oz/100 gals	141.5 a	147.9 b (65)	57.0 d (87)	17.9 fg (97)		
Tristar 30G (acetamiprid)	Foliar - 5.3 oz/100 gals	172.6 a	190.5 b (63)	61.0 d (89)	21.0 efg (97)		
Untreated		148.1 a	439.8 a (0)	473.9 a (0)	712.9 a (0)		

* Not an IR-4 experiment

^z Populations counted on 8 half leaves.

^y Means within columns followed by the same letter are not significantly different at p=0.05 (Tukey LSD).

Gilrein 2009b. In this experiment, Botanigard, M-Pede, SuffOil X were compared to Avid, Kontos, Safari, Sanmite, and TriStar for their impact on immature whiteflies (Table 81 - p85). This test was conducted in an open greenhouse where whiteflies could migrate from treatment to treatment. Immature whiteflies were counted on eight leaves per plant (these are all replicated trials), 8 replicates per treatment, or on halves of the leaves (due to very high infestation levels) - a severe test. Empty pupal cases were tallied at the end of the trial - an indication of what has survived the gauntlet. Several weekly sprays were applied, except for the single drench indicated. Synergy is now sold as SuffOil-X. M-Pede at a very low rate did not perform well. The experiment, however, did show some very good results with Avid, Kontos spray, Safari, Sanmite and TriStar (Table 82 - p85). The performance of TriStar was surprising because in previous work the efficacy wasn't as strong.

Treatment (Active	Application Method –	Application Dates					
Ingredient)	Rate / 100 gal	7/29	8/5	8/13	8/20		
Avid 0.15EC	8 fl oz	Х	Х	Х	Х		
Botanigard 22WP	3 lbs	Х	Х	Х	Х		
Kontos-drench	.1ml/L potting soil	Х					
Kontos-spray	3.4 fl oz	Х	Х	Х	Х		
M-Pede	0.25%	Х	Х	Х	Х		
Safari 20G	8 oz	Х	Х	Х	Х		
Sanmite	6 oz/gal	Х	Х	Х	Х		
Synergy aka SuffOil X	1%	Х	Х	Х	Х		
TriStar 30G	5.3 oz	X	X	X	X		
Water spray							

Table 81. *Efficacy of foliar applications for immature uncaged Bemisia B and Q Biotype Whiteflies on Poinsettia 'Orion Red' – Application Rates and Dates, Gilrein, 2009b.

Table 82. *Efficacy of foliar applications for immature uncaged Bemisia B and Q Biotype Whiteflies on Poinsettia 'Orion Red', Gilrein, 2009b^z.

Transformer () altern	Population Counts, Means Separations, and Henderson's % Control y							
I reatment (Active		Immature Q Whiteflies						
Ingredient)	Precount	5 DAT ^v	20 DAT ^w	26 DAT ^w	Cases			
Avid 0.15EC	310.6 a	373.4 ab (45)	98.9 cd (96)	58.0 b (98)	456.6 bc			
Botanigard 22WP	305.3 a	262.1 ab (61)	300.8 bc (88)	1,559.3 a (58)	307.6 bcd			
Kontos-drench	259.9 a	223.0 ab (61)	116.9 c (95)	1,254.8 a (60)	74.8de			
Kontos-spray	262.3 a	200.8 b (65)	41.4 de (98)	0.4 c (100)	24.0 e			
M-Pede	334.4 a	353.0 ab (52)	656.5 b (76)	1,229.8 a (70)	573.3 b			
Safari 20G	304.3 a	235.6 ab (65)	9.8 f (100)	0.0 c (100)	239.9 bcd			
Sanmite	289.6 a	322.5 ab (49)	101.8 c (96)	54.5 b (98)	397.4 bc			
Synergy	352.4 a	213.3 b (72)	161.9 c (94)	1.8 c (100)	161.6 cde			
Tristar 30G	264.0 a	468.0 ab (19)	26.0 e (99)	0.0 c (100)	523.4 b			
Water spray	255.9 a	560.6 a (0)	2,093.6 a (0)	3,093.5 a (0)	1122.9a			

* Not an IR-4 Trial

^z At the start of the experiment, B was 8% and Q was 92% of the population according to esterase assay (Dr. Frank Byrne).

^y Populations counted on half of 8 fully expanded leaves.

^x Means within columns followed by the same letter are not significantly different at p=0.05 (Tukey LSD).

^w Data were transformed prior to analysis using ln(y+1)

^v Data were transformed prior to analysis using sq(y).

Oetting 2009a-e. A series of 5 trials were conducted in 2009 to attempt to induce resistance or lose control of the Q biotype of *Bemisia* with label rates of the insecticides considered most effective against this biotype. The first trial was a continuation of pesticide resistance trials that have been conducted for several months. Insecticides were applied as foliar sprays at 14 or 21-day intervals from Jan 21, Feb 4, 23, and Mar 18, 2009 on caged whiteflies that have survived repeated treatments of the same products. Pretreatment counts were taken on Jan 21. In this trial dinotefuran was applied at 4 oz, half the recommended rate; all other products were applied at labeled rates. All products except Flagship provided excellent control (Table 83). At the end of the trial there was no significant difference between the Check and Flagship. There was evidence that this was coming in the fall 2008 trials. The mode of action of Flagship is very close to Marathon and susceptibility to Flagship may be lost very soon. Good control of whiteflies resistant to Marathon was obtained with Flagship in 2008.

In the second trial, insecticides were applied as foliar sprays at 14-day intervals from Apr 27, May 13, and May 27 2009. Pretreatment counts were taken on April 27. This trial already shows the effect of differential control in the preceding trial, with BYI 8330, Judo, Safari and Tristar starting with low populations while Flagship showed signs of reduced control, with population of immature similar to Check at the beginning of the trial (Table 84). The populations did not drop, but continued to increase and peaked on May 25. At this time the plants that had the highest populations were removed because they were about dead. This resulted in a lower population level in these two treatments on June 3. The four compounds that were efficacious continued to perform well throughout the trial. The trial was terminated because of the loss of plants that were heavily infested and powdery mildew on the plants.

In the third trial, Salvia was used as host plant and whiteflies previously treated with Flagship were treated with Safari at 6 oz. Insecticides were applied as foliar sprays at 14-day intervals from May 27 and Jun 10, and first population counts taken on June 3. In this trial, significant reduction of adults and immature was still obtained, but the populations were higher (Table 85). The populations in the BYI 8330 treatment were the only ones that were really noticeably reduced and near acceptable. At this point, the label rate of Flagship was no longer effective and the half rate of Safari was not performing as well as in earlier trials. The rate of 6 oz, which is less than the 8 ounce rate recommended for whiteflies as a foliar spray, should allow some survival so the same population of whiteflies can be treated continuosly with Safari.

Control with the half rate of Safari was going down in the fourth trial so the rate was increased to 8 oz which is the lowest recommended rate for foliar spray against *Bemisia*. In addition the BYI 8330 rate was raised from 1.7 oz to 2 oz. Insecticides were applied as foliar sprays at 14-day intervals from July 2, 16, 30, and Aug 19, 2009. Pretreatment counts were taken on July 1 (Table 86). In this experiment the Check cages were lost because the leaves became so encrusted with whitefly immatures it was impossible to count adults or immatures. Some new plants were placed in the cages and counts were resumed on Aug 19, but these counts would not be statistically valid. During this cycle of treatments, control of whiteflies was lost with BYI 8330, Judo and Tristar, although the counts for these treatments would still be lower than Check. An interesting phenomenon was the whiteflies in the old Flagship cages were finally controlled with 6 oz of Safari, and the increased rate of Safari from 4 to 8 oz also controlled the whiteflies. This will make continuing these treatments difficult.

The fifth trial was the final in a series of 5 trials conducted in 2009 and the first back on poinsettia as the host plant. Two plants were moved into each cage with the Salvia plants that had been exposed to the same treatments. Insecticides were applied as foliar sprays at 14-day intervals from Sep 2 and 16, 2009, and first population counts taken on Sep 2. The best treatments were obviously the Safari treatments, however running statistics on the treatments was discontinued after Sept 16 (Table 87). At that time the population of whiteflies was so high on the Check plants that adults and immature could not be counted and the plants soon died. They were removed from the cages and treatments were discontinued. Safari at

8 oz was disappointing as it did not have a lower population. This population had been exposed to Safari for more than the entire year. However the rate was raised from 4 oz to 8 oz and got good control in the previous trial. This time the control was not as good. The best control was obtained with Safari at 6 oz, but this population had not been exposed to this chemical the whole time. They had been exposed to Flagship over the first three treatment series. BYI 8330, Judo and Tristar were obviously not as effective, although there was 30 to 70 % reduction. This had been an interesting series of experiments and it is obvious that under intense pressure of continued use of an insecticide resistance can be developed. It is also interesting that neonicotinoids which supposedly have the same mode of action do not lose susceptibility at the same rate, nor is there cross resistance. This is very obvious where control with Flagship was lost only to get it back when treatment was changed to Safari. However, every indication was that there was some cross resistance with Flagship and Marathon.

Table 83. Development of tolerance to certain insecticides with caged Bemisia tabaci Q Biotype Whiteflies on Poinsettia 'Polly Pink', Oetting, 2009a.

	Data Dar	Population Counts, Means Separations, and % Control ^y									
Treatment (Active Ingredient)	100 Gal	7 DAT	14 DAT	21 DAT	35 DAT	49 DAT	63 DAT	70 DAT	77 DAT	84 DAT	91 DAT
	100 Gui	1/28	2/4	2/11	2/25	3/11	3/25	4/1	4/8	4/15	4/22
	-			Immatu	res	-		-			-
Flagship 25WG (thiamethoxam)	4 oz	8.0 b	10.6 a	11.1 b	10.3 b	42.0 a	35.0 a	76.5 a	118.3 a	166.1 a	182.9 a
		(47)	(0)	(48)	(60)	(7)	(0)	(36)	(0)	(7)	(24)
Judo (spiromesifen)	4 fl oz	8.3 b	5.1 a	3.7 b	3.6 b	5.3 b	1.4 c	0.8 b	4.0 b	17.0 b	19.3 b
Judo (sphomesnen)		(45)	(44)	(83)	(86)	(88)	(94)	(99)	(96)	(91)	(92)
Kontos (spirotetramat)	1.7 fl oz	11.1 ab	4.6 a	3.9 b	3.3 b	7.6 b	6.5 bc	3.8 b	9.5 b	27.1 b	25.8 b
		(26)	(49)	(82)	(87)	(83)	(72)	(97)	(91)	(85)	(89)
Safari 208G (dinotefuran)	4 oz	8.4 b	8.6 a (5)	10.1 b	4.1 b	4.6 b	2.1 c	4.9 b	8.9 b	18.9 b	24.3 b
Sului 2000 (dilotorului)		(44)		(53)	(84)	(90)	(91)	(96)	(91)	(89)	(90)
Tristar 30SG (acetamiprid)	4 oz	18.8 a	8.0 a	10.4 b	3.6 b	1.5 b	0.3 c	3.4 b	1.0 b	4.6 b	11.5 b
		(0)	(12)	(52)	(86)	(97)	(99)	(97)	(99)	(97)	(95)
Check		15.0 ab	9.1 a (0)	21.5 a	26.0 a	45.0 a	23.0 ab	118.8 a	102.3 a	179.4 a	239.9 a
		(0)		(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
	-			Adult	s	-		-			-
Flagship 25WG (thiamethoxam)	4 oz	1.9 a (0)	1.3 a	0.9 a	2.0 ab	5.4 a	10.4 a	11.6 a	29.4 a	25.4 b	33.8 a
			(18)	(44)	(13)	(36)	(0)	(23)	(0)	(54)	(39)
Judo (spiromesifen)	4 fl oz	1.3 a (7)	0.3 a	0.5 a	1.3 ab	1.5 b	1.0 b	1.9 b	4.1 b	4.8 b	7.0 b
Judo (spiromesnen)			(80)	(69)	(43)	(82)	(87)	(87)	(78)	(91)	(87)
Kontos (spirotetramat)	1.7 fl oz	2.8 a (0)	0.8 a	1.4 a	0.5 b	0.9 b	2.0 b	2.4 b	3.6 b	5.6 b	8.3 b
			(47)	(13)	(78)	(89)	(73)	(84)	(81)	(90)	(85)
Safari 208G (dinotefuran)	4 oz	0.1 a	0.6 a	1.0 a	0.6 ab	1.1 b	0.6 b	1.0 b	3.6 b	3.4 b	7.8 b
Salari 2000 (unioterurali)		(93)	(60)	(38)	(74)	(87)	(92)	(93)	(81)	(94)	(86)
Tristar 30SG (acetamiprid)	4 oz	0.8 a	1.1 a	0.5 a	0.4 b	0.3 b	1.4 b	0.4 b	2.0 b	1.8 b	4.5 b
		(43)	(27)	(69)	(83)	(96)	(81)	(97)	(89)	(97)	(92)
Check		1.4 a (0)	1.5 a (0)	1.6 a	2.3 a (0)	8.5 a (0)	7.5 a (0)	15.0 a	18.8 a	54.9 a	55.3 a
				(0)				(0)	(0)	(0)	(0)

^y Populations counted on the underside of 3 leaves on 2 plants.
 ^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Table 84. Development of tolerance to certain insecticides with caged Bemisia tabaci Q Biotype Whiteflies on Poinsettia 'Polly Pink', Oetting, 2009b.

	Data Dan		Population Cou	ts, Means Separations, and % Control ^y			
Treatment (Active Ingredient)	Kate Per	1 DAT	15 DAT	21 DAT	29 DAT	36 DAT	
	100 Gai	4/28	5/13	5/19	5/27	6/3	
			Immatures				
Flagship 25WG (thiamethoxam)	4 oz	333.8 a (26)	517.8 a (15)	516.9 a (22)	2203.1 a (88)	95.8 b (73)	
Judo (spiromesifen)	4 fl oz	29.1 b (94)	31.0 b (95)	22.9 b (97)	45.9 b (100)	63.9 b (82)	
Kontos (spirotetramat)	1.7 fl oz	61.9 b (86)	21.8 b (96)	17.8 b (97)	44.4 b (100)	20.7 c (94)	
Safari 20SG (dinotefuran)	4 oz	27.0 b (94)	115.9 b (81)	129.1 b (80)	115.3 b (99)	73.8 b (79)	
Tristar 30SG (acetamiprid)	4 oz	12.4 b (97)	28.8 b (95)	24.5 b (96)	55.0 b (100)	82.1 b (76)	
Check		453.6 a (0)	612.5 a (0)	661.3 a (0)	18454.4 a (0)	348.6 a (0)	
	-		Adults	-			
Flagship 25WG (thiamethoxam)	4 oz	66.8 a (0)	96.0 a (28)	100.0 b (28)	124.1 a (10)	19.8 b (73)	
Judo (spiromesifen)	4 fl oz	5.4 b (91)	11.8 b (91)	9.8 c (93)	16.3 b (88)	15.4 b (79)	
Kontos (spirotetramat)	1.7 fl oz	16.1 b (74)	8.6 b (94)	10.0 c (93)	13.5 b (90)	11.0 b (85)	
Safari 20SG (dinotefuran)	4 oz	2.6 b (96)	12.6 b (91)	14.0 c (90)	19.9 b (86)	14.8 b (80)	
Tristar 30SG (acetamiprid)	4 oz	4.5 b (93)	6.8 b (95)	6.6 c (95)	13.8 b (90)	15.5 b (79)	
Check		62.3 a (0)	133.1 a (0)	139.6 a (0)	137.4 a (0)	74.3 a (0)	

^y Populations counted on the underside of 3 leaves.
 ^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Table 85. Development of tolerance to certain insecticides with caged I	Bemisia tabaci Q Biotype	Whiteflies on Salvia	(Salvia splendens),
Oetting, 2009c.			

	Data Dan	Population Counts, Means Separations, and % Control ^y									
Treatment (Active Ingredient)	Rate Per	7 DAT 14 DAT		21 DAT	28 DAT						
	100 Gai	6/3	6/10	6/17	6/24						
Immatures											
BYI 8330 (spirotetramat)	1.7 fl oz	102.3 c (61)	136.8 b (61)	19.8 c (95)	30.6 c (94)						
Judo (spiromesifen)	4 fl oz	137.4 bc (48)	142.3 b (59)	82.9 b (80)	107.7 b (79)						
Safari 20SG (dinotefuran)	4 oz	196.3 b (26)	148.9 b (57)	76.4 b (81)	118.2 c (77)						
Safari 20SG (dinotefuran)	бoz	140.8 bc (47)	158.4 b (55)	70.4 b (83)	70.8b c (86)						
Tristar 30SG (acetamiprid)	4 oz	171.6 b (35)	157.9 b (55)	52.1 bc (87)	77.9 bc (85)						
Check		265.7 a (0)	348.6 a (0)	412.5 a (0)	506.7 a (0)						
Adults											

	Data Dan	Population Counts, Means Separations, and % Control ^y								
Treatment (Active Ingredient)	100 Col	7 DAT	14 DAT	21 DAT	28 DAT					
	100 Gai	6/3	6/10	6/17	6/24					
BYI 8330 (spirotetramat)	1.7 fl oz	30.0 b (54)	17.3 b (77)	14.1 c (76)	18.3 c (77)					
Judo (spiromesifen)	4 fl oz	23.0 b (65)	30.0 b (60)	34.0 b (43)	37.7 b (53)					
Safari 20SG (dinotefuran)	4 oz	25.1 b (62)	26.3 b (65)	20.0 c (67)	28.7 bc (61)					
Safari 20SG (dinotefuran)	6 oz	33.7 b (48)	34.9 b (53)	14.1 c (76)	19.1 c (76)					
Tristar 30SG (acetamiprid)	4 oz	32.5 b (50)	24.0 b (68)	15.3 c (74)	27.7 bc (66)					
Check		65.3 a (0)	74.3 a (0)	59.9 a (0)	80.7 a (0)					

^y Populations counted on the underside of 3 leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Table 86. Development of tolerance to certain insecticides	with caged <i>Bemisia tabaci</i>	Q Biotype Whiteflies	on Salvia (<i>Salvia spl</i>	endens),
Oetting, 2009d.				

	Data Dam	Population Counts, Means Separations ^y									
Treatment (Active Ingredient)	100 Gal	Pretrt	7 DAT	14 DAT	22 DAT	29 DAT	35 DAT	42 DAT	49 DAT	53 DAT	
	100 000	7/1	7/8	7/15	7/23	7/30	8/5	8/12	8/19	8/23	
			Im	matures							
Judo (spiromesifen)	4 fl oz	95.0 bc	56.6 b	39.4 b	101.9 b	103.5 c	242.6 b	350.7 b	103.2 c	388.5 b	
Kontos (spirotetramat)	2 fl oz	48.4 cd	72.8 b	51.1 b	86.7 b	160.0 b	386.8 a	378.4 b	292.5 b	315.3 b	
Safari 20SG (dinotefuran)	б oz	22.9 d	8.3 c	6.2 c	10.2 c	9.0 e	13.8 c	13.8 c	19.6 c	0.0 c	
Safari 20SG (dinotefuran)	8 oz	117.2 bc	83.7 b	42.5 b	63.0 b	50.6 d	28.2 c	56.2 c	44.9 c	12.0 c	
Tristar 30SG (acetamiprid)	4 oz	139.3 b	191.0 b	178.3 a	167.8 a	211.8 a	292.5 ab	665.3 a	630.0 a	463.0 b	
Check		864.2 a	1573.3 a	-	-	-	-	-	365.0 b	715.0 a	
	-		1	Adults		=	=	=			
Judo (spiromesifen)	4 fl oz	34.4 b	50.1 b	53.2 b	58.0 b	75.5 b	72.6 a	53.4 b	43.7 c	78.6 b	
Kontos (spirotetramat)	2 fl oz	19.8 b	28.0 b	32.4 bc	38.3 bc	64.2 b	55.3 a	51.9 b	70.8 bc	78.4 bc	
Safari 20SG (dinotefuran)	6 oz	13.0 b	6.3 b	12.5 c	6.7 d	10.0 c	1.0 b	1.0 c	4.4 c	4.5 d	
Safari 20SG (dinotefuran)	8 oz	32.2 b	22.9 b	20.2 c	25.7 cd	29.5 c	6.3 b	5.2 c	7.0 c	11.6 cd	
Tristar 30SG (acetamiprid)	4 oz	31.7 b	55.8 b	85.5 a	92.7 a	126.9 a	77.1 a	84.4 a	144.5 b	125.4 b	
Check		346.8 a	435.0a	-	-	-	-	-	325.0 a	430.0 a	

^y Populations counted on the underside of 3 leaves.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

	Data Dan	Population Counts, Means Separations, and Henderson's % Control y									
Treatment (Active Ingredient)	Kate Per	Pretrt	6 DAT	14 DAT	21 DAT	28 DAT	35 DAT	42 DAT	49 DAT		
	100 Gai	9/2	9/8	9/16	9/23	9/30	10/7	10/14	10/21		
			Immatu	res							
Judo (spiromesifen)	4 fl oz	91.4 b	85.7 b	92.6 b	195.0	95.1	34.5	41.5	31.6		
Judo (spiromesnen)			(55)	(67)							
Kontos (spirotetramat)	2 fl oz	76.9 b	126.7 b	152.4 b	86.8	13.3	37.1	81.2	43.9		
			(33)	(63)							
Safari 208G (dinotefuran)	6 oz	59.3 b	55.0 b	4.4 b	37.3	19.5	12.6	9.7	4.0		
Salari 2050 (unioterurali)			(55)	(98)							
Safari 208G (dinotefuran)	8 oz	82.1 b	76.2 b	15.9 b	49.1	40.1	15.5	18.5	21.5		
Salari 2000 (dilloteraral)			(55)	(94)							
Tristar 30SG (acetamiprid)	4 oz	69.3 b	62.5 b	74.4 b	139.4	71.1	40.5	56.6	49.6		
			(56)	(64)							
Check		439.50	906.4 a	1436.0	-	_	_	_	_		
		а	(0)	a (0)							
		-	Adults	5		-					
Judo (spiromesifen)	4 fl oz	63.3 b	25.6 b	18.2 bc	12.1	13.7	17.8	13.6	17.5		
Judo (spiromesnen)			(69)	(47)							
Kontos (spirotetramat)	2 fl oz	63.9 b	27.0 b	31.8 bc	11.7	6.2	10.7	13.2	16.4		
			(68)	(13)							
Safari 208G (dinotefuran)	6 oz	43.1 b	3.9 b	6.9 c	1.7	1.1	4.2	3.1	3.7		
Salari 2000 (dilloteraral)			(93)	(0)							
Safari 208G (dinotefuran)	8 oz	40.4 b	13.6 b	16.6 bc	7.9	4.1	10.6	8.7	2.9		
Sului 2000 (dilotorurui)			(75)	(10)							
Tristar 30SG (acetamiprid)	4 oz	38.8 b	20.9 b	33.2 b	21.0	12.7	19.2	14.2	21.8		
			(59)	(0)							
Check		104.1 a	137.9 a	140.3 a	-	_	_	_	_		
			(0)	(0)							

Table 87. Development of tolerance to certain insecticides with caged *Bemisia tabaci* Q Biotype Whiteflies on Poinsettia 'Classical Red', Oetting, 2009e.

^y Populations counted on the underside of 3 leaves on 2 plants.

^x All letters following numbers within a column, that are different, are significantly different at the <0.05 level.

Efficacy Summary by Product

A brief efficacy summary for select products is given below, with a reminder that there are very limited published data available to draw definitive conclusions for each product/pest species. Products were selected based on interest in these products for testing for whitefly efficacy from 2004 to 2013.

A20520A (cyantraniliprole). This new product provided excellent control of *Bemisia tabaci* B Biotype in two trials.

Acelepryn / DPX-E2Y45 1.67SC (chlorantraniliprole). This product provided good control of *Bemisia tabaci* B Biotype in one trial but no control in a second trial.

Aria (flonicamid). Avid provided good efficacy against greenhouse whitefly in one trial, and good to excellent control of *Bemisia tabaci* B Biotype.

Avid 0.15EC (abamectin). Avid provided good efficacy against greenhouse whitefly in one trial, and good to excellent control of *Bemisia tabaci* B and Q Biotypes in 4 trials.

Azatin XL/ (azadirachtin). In two experiments, Azatin provide good to excellent control of *Bemisia tabaci* B Biotype.

BotaniGard ES/WP (Beauveria bassiana). Mixed efficacy (poor to excellent) on *Bemisia tabaci* B and Q Biotypes was obtained from BotaniGard ES or WP.

Flagship 25WG/0.22G, Meridian 25WG/0.33G (thiamethoxam). Flagship provided good to excellent control of greenhouse whitefly, but mixed efficacy (poor to excellent) against *Bemisia tabaci* B and Q Biotypes.

GF 2626 (sulfoxaflor) This new product exhibited good to excellent control of Bemisia tabaci B Biotype in 2 trials.

GF 2860 (spinoteram+sulfoxaflor). This new product exhibited excellent control of Bemisia tabaci B Biotype in 4 trials.

Judo (spiromesifen). In general, Judo provided excellent control of Bemisia tabaci B and Q Biotype; it was one of the best performing products.

Kontos / BYI-8330 (spirotetramat). In general, Judo provided excellent control of Bemisia tabaci B and Q Biotypes; it was one of the best performing products.

Marathon (**imidacloprid**). Marathon provided good efficacy against greenhouse whitefly in one trial, but generally poor control of Bemisia tabaci B and Q Biotypes.

MBI 203 (Chromobacterium subtsugae strain PRAA4-1T). This product exhibited variable efficacy (poor to good) for *Bemisia tabaci* B Biotype in 4 trials.

MBI 206 (Burkholderia sp. strain A396). This product exhibited variable efficacy (poor to good) for *Bemisia tabaci* B Biotype in 3 trials.

NNI-0101 SC (pyrifluquinazon). This product provided excellent control of *Bemisia tabaci* B Biotype in 3 trials.

Preferal (Isaria fumosoroseus). Preferal exhibited poor efficacy for Bemisia tabaci B Biotype in 2 trials.

Proud 3 (thyme oil). Proud 3 exhibited poor efficacy for Bemisia tabaci B Biotype in 2 trials.

Pyranica (tebufenpyrad). This product provided mediocre control of *Bemisia tabaci* B Biotype in one trial.

Safari (dinotefuran). In general, Safari provided excellent control of Bemisia tabaci B and Q Biotypes, and of greenhouse whitefly; it was one of the best performing products.

Sanmite / GWN-1725 (pyridaben). In general, Sanmite provided good to excellent control of Bemisia tabaci B and Q Biotypes.

Synergy / Ultra Pure Oil (petroleum oil). This active ingredient provided good to excellent control of Bemisia tabaci B Biotype.

Tristar (acetamiprid). Tristar provided excellent control of Bemisia tabaci B and Q Biotypes, and good to excellent control of greenhouse whitefly

Phytotoxicity

In general most products did not exhibit damage to the treated crops. However, Botanigard ES, Safer Insect Killing Soap, UltraPure Oil and MBI-206 did cause injury to poinsettia in some trials. Please refer to the reports submitted by Gu, 2008, Gilrein 2006 and 2012, and Frank 2012 for more details.

Table 88. Summary of product efficacy by whitefly and crop. Note: Table entries are sorted by product, whitefly Latin name, and then by crop Latin name. Only those IR-4 trials received by 6/1/2014 are included in the table below.

PR#	Product (Active	Target	Crop	Production	Researcher	Trial	Trial	Application	Results
	Ingredients)			Site		State	Year	Туре	
29284	Acelepryn (aka DPX- E2Y45) 1.67 (Chlorantraniliprole)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 1: Fair to good control at 19 oz per 100 gal (using dessication method and blue sticky card).
29284	Acelepryn (aka DPX- E2Y45) 1.67 (Chlorantraniliprole)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 2: No control at 19 oz per 100 gal (using dessication method and blue sticky card).
25186	Acelepryn (aka DPX- E2Y45) 1.67 (Chlorantraniliprole)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Dynasty Red'	Greenhouse	Oetting	GA	2005	Drench	Poor control of adults and some management of immatures (~70%) with 151 ml per 100 gal drenched at 240 ml per 6" pot.
25186	Acelepryn (aka DPX- E2Y45) 1.67 (Chlorantraniliprole)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Prestige Red'	Greenhouse	Oetting	GA	2006	Drench	Experiment 2: Poor to mediocre efficacy at 6.47 fl oz per 100 gal. (Q 83% : B 17%)
29276	Agri-50 (Propylene glycol alginate (hydrated))	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 1: No significant control at 53 oz per 100 gal (using dessication and blue sticky card for counts).
29276	Agri-50 (Propylene glycol alginate (hydrated))	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 2: No significant control at 53 oz per 100 gal (using dessication and blue sticky card for counts).
25188	Aria 50SG (Flonicamid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Dynasty Red'	Greenhouse	Oetting	GA	2005	Drench	Suppression for both immatures and adults with a rate of 120 g per 100 gal drenched at 120 ml per 6" pot.
25188	Aria 50SG (Flonicamid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Advent Red'	Greenhouse	Oetting	GA	2008	Foliar	Experiment9: Significant reduction in adults and immature Q biotype with 4 oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
25987	Aria 50SG (Flonicamid)	Greenhouse Whitefly (Trialeurodes vaporariorum)	Marigold (Tagetes sp.) 'Queen Sophia'	Greenhouse	Davis	MI	2005	Foliar	Excellent efficacy with 60 and 120 g per 100 gal.
28007	Aria N 50WG (Flonicamid)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima)	Greenhouse	Nielsen	ОН	2002	Foliar	Poor efficacy with 60, 120, and 240 per 100 gal; no injury observed with tested rates.
28007	Aria N 50WG (Flonicamid)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 1: Fair control at 17 DAT using 122 g per 100 gal (using dessication and blue sticky card for counts).
28007	Aria N 50WG (Flonicamid)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 2: No control at 10 DAT using 122 g per 100 gal (using dessication and blue sticky card for counts).
25970	Avid 0.15EC (Abamectin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Advent Red'	Greenhouse	Oetting	GA	2008	Foliar	Experiment9: Significant reduction in adutls and immature Q biotype with 8 oz per 100 gal.
25970	Avid 0.15EC (Abamectin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2009	Foliar	Experiment 2: Great efficacy with 8 fl oz per 100 gal.
25970	Avid 0.15EC (Abamectin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Oetting	GA	2006	Foliar	Experiment 4: Marginal efficacy with 8 fl oz per 100 gal. (Q 83% : B 17%)
26704	Botanigard 22WP (Beauveria bassiana GHA)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2006	Foliar	Poor efficacy at 2 lb per 100 gal
26704	Botanigard 22WP (Beauveria bassiana GHA)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2009	Foliar	Experiment 2: About 50 % reduction in populations with 3 lb per 100 gal.
28913	BotaniGard ES (BioWorks) (Beauveria bassiana)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 1: No significant control at 284 g per 100 gal (using dessication and blue sticky card for counts).

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
28913	BotaniGard ES (BioWorks) (Beauveria bassiana)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 2: No control at 284 g per 100 gal (using dessication and blue sticky card for counts).
25857	BotaniGard ES (BioWorks) (Beauveria bassiana)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2006	Foliar	Poor efficacy at 2 qt per 100 gal; phytotoxic
25857	BotaniGard ES (BioWorks) (Beauveria bassiana)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Oetting	GA	2006	Foliar	Experiment 3: Some reduction of adults and immatures at 32 fl oz per 100 gal. (Q 83% : B 17%)
25161	Celero 16WSG (Clothianidin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Dynasty Red'	Greenhouse	Oetting	GA	2005	Drench	Suppression of adults and slightly better management of immatures (~75%) with 6.3 oz per 100 gal drenched at 120 ml per 6" pot.
25161	Celero 16WSG (Clothianidin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Bright Red'	Greenhouse	Bethke	CA	2005	Drench	Experiment 1: Fair efficacy at 4 oz per 2000 6" pots
25161	Celero 16WSG (Clothianidin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Bright Red'	Greenhouse	Bethke	CA	2005	Drench	Experiment 3: Fair efficacy at 4 oz per 100 gal
26131	DPX-HGW86 (Cyantraniliprole)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Prestige Red'	Greenhouse	Oetting	GA	2006	Drench	Experiment 2: Good to excllent, but variable, control of immatures and adults at 6.47, 9.7, and 12.94 fl oz per 100 gal. (Q 83% : B 17%)
29277	EcoTrol (Rosemary Oil)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 1: No significant control at 10 oz per 100 gal (using dessication and blue sticky card for counts).
29277	EcoTrol (Rosemary Oil)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 2: No control at 10 oz per 100 gal (using dessication and blue sticky card for counts).
26084	EcoTrol (Rosemary Oil)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Prestige Red'	Greenhouse	Oetting	GA	2006	Drench	Experiment 2: Mediocre to good control at 10 fl oz per 100 gal. (Q 83% : B 17%)

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
29285	Endeavor (Pymetrozine)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 1: No control with 284 g per 100 gal (using dessication and blue sticky card for counts).
29285	Endeavor (Pymetrozine)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 2: No control with 284 g per 100 gal (using dessication and blue sticky card for counts).
26708	ERASE (Jojoba oil)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2006	Foliar	Fair efficacy at 1 gal per 100 gal; phytotoxic
29531	Flagship 25WG (Thiamethoxam)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Saturnis'	Greenhouse	Frank	NC	2012	Foliar	Excellent reduction of eggs and juveniles with 8.5 oz per 100 gal applied twice.
25160	Flagship 25WG (Thiamethoxam)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Dynasty Red'	Greenhouse	Oetting	GA	2005	Foliar	Poor to fair control of immatures and adults at 3 oz per 100 gal.
25160	Flagship 25WG (Thiamethoxam)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Advent Red'	Greenhouse	Oetting	GA	2008	Foliar	Experiment9: Significant reduction in adults and immature Q biotype with 4 oz per 100 gal.
25160	Flagship 25WG (Thiamethoxam)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Bright Red'	Greenhouse	Bethke	CA	2005	Drench	Experiment 1: Fair efficacy at 4 oz per 100 gal
25160	Flagship 25WG (Thiamethoxam)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Bright Red'	Greenhouse	Bethke	CA	2005	Drench	Experiment 3: Good efficacy at 4 oz per 100 gal
25160	Flagship 25WG (Thiamethoxam)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Red'	Greenhouse	Bethke	CA	2006	Drench	Excellent efficacy at 1 oz per 100 gal
25160	Flagship 25WG (Thiamethoxam)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Polly Pink'	Greenhouse	Oetting	GA	2009	Foliar	Experiment 2: Good efficacy at 4 oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
25988	Flagship 25WG (Thiamethoxam)	Greenhouse Whitefly (Trialeurodes vaporariorum)	Marigold (Tagetes sp.) 'Queen Sophia'	Greenhouse	Davis	MI	2005	Foliar	Excellent efficacy with 2 and 4 oz per 100 gal.
31634	GF-2626 1SC (Sulfoxaflor)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2012	Foliar	Good control of immatures with 5.5 and 11 fl oz per 100 gal applied 3 times; higher rate better.
31634	GF-2626 1SC (Sulfoxaflor)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Saturnis'	Greenhouse	Frank	NC	2012	Foliar	Excellent reduction of eggs and juveniles with 5.5 and 11 fl oz per 100 gal applied 3 times.
32082	GF-2860 40WG (Spinetoram + sulfoxaflor)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Rapeseed/Ornamental Kale (Brassica napus) Brassica oleracea 'Crane Red'	Greenhouse	Chong	SC	2013	Foliar	Excellent control of sweetpotato whitefly (B-biotype) immatures with 2, 2.75 and 3.5 oz per 100 gal applied 3 times; better than Judo and UltraFine Oil.
31635	GF-2860 40WG (Spinetoram + sulfoxaflor)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2012	Foliar	Great control of immatures with 3.5 and 7 oz per 100 gal applied 3 times; higher rate slightly better.
31635	GF-2860 40WG (Spinetoram + sulfoxaflor)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Saturnis'	Greenhouse	Frank	NC	2012	Foliar	Excellent reduction of eggs and juveniles with 3.5 and 7 oz per 100 gal applied 3 times.
31516	GF-2860 40WG (Spinetoram + sulfoxaflor)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Vervain (Verbena sp.) 'Superbena Royal Peechy Keen'	Greenhouse	Villavicencio	CA	2013	Foliar	Excellent control of nymphs with 2, 2.75 and 3.5 oz per 100 gal + Capsil applied twice.
32084	Grandevo (MBI 203 DF) (Chromobacterium subtsugae NRRL B- 30655)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Rapeseed/Ornamental Kale (Brassica napus) Brassica oleracea 'Crane Red'	Greenhouse	Chong	SC	2013	Foliar	No consistent control of sweetpotato whitefly (B-biotype) immatures with 2 and 4 lb per 100 gal applied 5 times.
31236	Grandevo (MBI 203 DF) (Chromobacterium subtsugae NRRL B- 30655)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Saturnis'	Greenhouse	Frank	NC	2012	Foliar	Good reduction of eggs and juveniles with 2 and 4 lb per 100 gal applied 5 times.
31517	Grandevo (MBI 203 DF) (Chromobacterium subtsugae NRRL B- 30655)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Vervain (Verbena sp.) 'Superbena Royal Peechy Keen'	Greenhouse	Villavicencio	CA	2013	Foliar	Poor control of nymphs with 2 and 4 lb per 100 gal applied 5 times.

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
31236	Grandevo (MBI 203 DF) (Chromobacterium subtsugae NRRL B- 30655)	TBD (TBD)	TBD (TBD) 'Orion Red'	Greenhouse	Gilrein	NY	2012	Foliar	Mediocre control of immatures with 2 and 4 lb per 100 gal applied 5 times.
32088	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Rapeseed/Ornamental Kale (Brassica napus) Brassica oleracea 'Red Crane'	Greenhouse	Chong	TN	2013	Foliar	
29283	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 1: Excellent control at 4 oz per 100 gal (using dessication and blue sticky card for counts).
29283	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 2: Excellent control at 4 oz per 100 gal (using dessication and blue sticky card for counts).
31521	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Vervain (Verbena sp.) 'Superbena Royal Peechy Keen'	Greenhouse	Villavicencio	CA	2013	Foliar	Excellent control of nymphs with 8 fl oz per 100 gal applied twice.
25187	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Classical Red'	Greenhouse	Oetting	GA	2009	Foliar	Experiment 6: Good efficacy at 4 oz per 100 gal.
25187	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Dynasty Red'	Greenhouse	Oetting	GA	2005	Foliar	Poor control of adults but excellent control of immatures (>95%) with 4 fl oz per 100 gal foliar application.
25187	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Advent Red'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 9: Great efficacy at 8 oz per 100 gal.
25187	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Red Velvet'	Greenhouse	Oetting	GA	2010	Foliar	Virtually complete control of immatures and adults with 4 fl oz per 100 gal (Q 35%).
25187	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2006	Foliar	Good efficacy at 2 and 4 fl oz per 100 gal

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
25187	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Polly Pink'	Greenhouse	Oetting	GA	2009	Foliar	Experiment 2: Good efficacy at 4 oz per 100 gal.
25187	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Foliar	Experiment 4: Great to excellent control at 2 and 4 oz per 100 gal with single foliar application lasting through 58 DAT. (Q 100%)
25187	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Foliar	Experiment 7: Good to excellent control of immatures starting at 35 DAT; good control of adults with 2 and 4 fl oz per 100 gal. (Q 100%)
28246	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Pentas (Pentas sp.) 'Graffitti Violet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment1: Good control at 4 and 8 fl oz per 100 gal; initial plant injury with complete recovery
28252	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens)	Greenhouse	Oetting	GA	2009	Foliar	Experiment 3: Good efficacy at 4 oz per 100 gal.
28252	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens)	Greenhouse	Oetting	GA	2009	Foliar	Experiment 4: Mediocre efficacy at 4 oz per 100 gal.
28252	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Queen Scarlet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 3: Great to excellent efficacy at 4, 8, and 12 oz per 100 gal in caged experiment.
28252	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Queen Scarlet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 4: Great to excellent efficacy at 4, 8, and 12 oz per 100 gal in uncaged experiment.
28252	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Vista Burgundy'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 2: Good control at 4 and 8 fl oz per 100 gal
28249	Judo 2SC (Spiromesifen)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Wishbone Flower (Torenia sp.) 'Clown Violet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment1: Good control at 4 and 8 fl oz per 100 gal; initial plant injury at 8 oz with complete recovery

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
27994	Kontos (BYI 8330 240SC) (Spirotetramat)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Classical Red'	Greenhouse	Oetting	GA	2009	Foliar	Experiment 6: Good efficacy at 4 oz per 100 gal.
27994	Kontos (BYI 8330 240SC) (Spirotetramat)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Advent Red'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 9: Great efficacy at 1.7 oz per 100 gal.
27994	Kontos (BYI 8330 240SC) (Spirotetramat)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2009	Drench	Experiment 2: Poor efficacy with 0.1 ml per L potting soil.
27994	Kontos (BYI 8330 240SC) (Spirotetramat)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2009	Foliar	Experiment 2: Excellent efficacy at 3.4 oz per 100 gal.
27994	Kontos (BYI 8330 240SC) (Spirotetramat)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Polly Pink'	Greenhouse	Oetting	GA	2009	Foliar	Experiment 2: Great efficacy at 1.7 oz per 100 gal.
28254	Kontos (BYI 8330 240SC) (Spirotetramat)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens)	Greenhouse	Oetting	GA	2009	Foliar	Experiment 3: Great efficacy at 1.7 oz per 100 gal.
28254	Kontos (BYI 8330 240SC) (Spirotetramat)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens)	Greenhouse	Oetting	GA	2009	Foliar	Experiment 4: Good efficacy at 2 oz per 100 gal.
28254	Kontos (BYI 8330 240SC) (Spirotetramat)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Queen Scarlet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 3: great efficacy at 1.7 oz per 100 gal on adults and immatures.
28254	Kontos (BYI 8330 240SC) (Spirotetramat)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Queen Scarlet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 4: Great Efficacy at 1.7 oz per 100 gal.
32083	Mainspring (A20520A) 200SC (Cyantraniliprole)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Rapeseed/Ornamental Kale (Brassica napus) Brassica oleracea 'Crane Red'	Greenhouse	Chong	SC	2013	Foliar	Excellent control of sweetpotato whitefly (B-biotype) immatures with 8 and 16 fl oz per 100 gal applied twice; better than Judo and UltraFine Oil.

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
31515	Mainspring (A20520A) 200SC (Cyantraniliprole)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Vervain (Verbena sp.) 'Superbena Royal Peechy Keen'	Greenhouse	Villavicencio	CA	2013	Foliar	Excellent control of nymphs with 8 and 16 fl oz per 100 gal applied twice.
25159	Marathon II (Imidacloprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Advent Red'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 9: Some reduction in populations with 2 oz per 100 gal.
25159	Marathon II (Imidacloprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Bright Red'	Greenhouse	Bethke	CA	2005	Drench	Experiment 1: Poor efficacy at 1.7 fl oz per 1000 6" pots
25159	Marathon II (Imidacloprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Bright Red'	Greenhouse	Bethke	CA	2005	Drench	Experiment 3: Fair efficacy at 1.7 fl oz per 100 gal
25159	Marathon II (Imidacloprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Drench	Experiment 4: Poor efficacy with 1.7 fl oz drench per 1000 pots.
25159	Marathon II (Imidacloprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Drench / Foliar	Experiment 1: Excellent control with initial drench (3.4 fl oz per 1000 pots) followed by foliar applications at 1.7 fl oz per 100 gal. (Q 100%)
28247	Marathon II (Imidacloprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Pentas (Pentas sp.) 'Graffitti Violet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment1: No control at 2 fl oz per 100 gal; initial plant injury with complete recovery
28253	Marathon II (Imidacloprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Queen Scarlet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 3: Very little impact on populations at 2 fl oz per 100 gal.
28253	Marathon II (Imidacloprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Queen Scarlet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 4: Very little impact on populations at 2 fl oz per 100 gal.
28253	Marathon II (Imidacloprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Vista Burgundy'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 2: No to poor control at 2 fl oz per 100 gal; slight transient injury.

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
28250	Marathon II (Imidacloprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Wishbone Flower (Torenia sp.) 'Clown Violet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment1: No control at 2 fl oz per 100 gal.
25737	MilStop (Potassium bicarbonate)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Dynasty Red'	Greenhouse	Oetting	GA	2005	Foliar	Mediocre control of adults and immatures with 2.5 lb per 100 gal foliar application.
26706	M-Pede (Horticulture Soap)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2006	Foliar	Excellent efficacy at 2 gal per 100 gal; slight phytotoxicity
26706	M-Pede (Horticulture Soap)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2009	Foliar	Experiment 2: Some impact on high population levels at 0.25%.
28914	NoFly WP (Paecilomyces fumosoroseous strain FE 9901)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige Red'	Greenhouse	Oetting	GA	2007	Foliar	Great control of adults at 50 oz per 100 gal with applications at 3-5 days, but efficacy dropped after applications ended; poor efficacy with 100 oz per 100 gal at 7 d intervals.
28914	NoFly WP (Paecilomyces fumosoroseous strain FE 9901)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Saturnis'	Greenhouse	Frank	NC	2012	Foliar	Good reduction of eggs and juveniles with 16 oz per 100 gal applied 3 times.
26702	Ornazin 3%EC (Azadirachtin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2006	Foliar	No efficacy at 10 fl oz per 100 gal
25992	Orthene TTO 97 (Valent) (Acephate)	Greenhouse Whitefly (Trialeurodes vaporariorum)	Marigold (Tagetes sp.) 'Queen Sophia	Greenhouse	Davis	MI	2005	Foliar	Fair to good efficacy with 1 lb per 100 gal.
29278	Pedestal (Novaluron)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 1: Good control at 17DAT using at 8 oz per 100 gal (dessication and blud sticky card for counts).
29278	Pedestal (Novaluron)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 2: No control at 10DAT using at 8 oz per 100 gal (dessication and blud sticky card for counts).

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26082	Pedestal (Novaluron)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Prestige Red'	Greenhouse	Oetting	GA	2006	Foliar	Experiment 2: Some reduction in adults and immatures, but not commercially acceptable, at 8 fl oz per 100 gal. (Q 83% : B 17%)
31633	Preferal (SePro) (Isaria fumosoroseus)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Saturnis'	Greenhouse	Frank	NC	2012	Foliar	Good reduction of juveniles with 14 and 28 oz per 100 gal applied 3 times.
31633	Preferal (SePro) (Isaria fumosoroseus)	TBD (TBD)	TBD (TBD) 'Orion Red'	Greenhouse	Gilrein	NY	2012	Foliar	Poor control of immatures with 14 and 28 oz per 100 gal applied 3 times.
26707	ProMate Revoke (Potassium salts of fatty acids)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2006	Foliar	Fair efficacy at 1-2 gal per 100 gal
32081	Proud 3 (Thyme oil (5.6%))	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	TBD (TBD) Brassica oleracea 'Crane Red'	Greenhouse	Chong	SC	2013	Foliar	No consistent control of sweetpotato whitefly (B-biotype) immatures with 4 qt per 100 gal applied 5 times.
31573	Proud 3 (Thyme oil (5.6%))	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Vervain (Verbena sp.) 'Superbena Royal Peechy Keen'	Greenhouse	Villavicencio	CA	2013	Foliar	Mediocre control of nymphs with 1 gal per 100 gal applied 5 times.
32086	Pyranica (Tebufenpyrad)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Rapeseed/Ornamental Kale (Brassica napus) Brassica oleracea 'Crane Red'	Greenhouse	Chong	SC	2013	Foliar	Mediocre control of sweetpotato whitefly (B-biotype) immatures with 16 fl oz per 100 gal applied twice; comparable to Judo and UltraFine Oil.
26142	QRD 400 (Extract of Chenopodium ambrosioides)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion'	Greenhouse	Oetting	GA	2006	Foliar	Experiment 3: Some reduction in adults and immatures at 0.5 and 1.0 %, but not commercially acceptable. (Q 83% : B 17%)
27685	Rotation: Judo 4SC / Avid (Spiromesefin / abamectin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Foliar	Experiment 1: Delayed application timing and heavy population pressure lead to slow control, but by the end of the experiment excellent control was achieved with 4 fl oz / 8 fl oz per 100 gal. (O 100%)

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
27686	Rotation: Marathon / Avid (Imidacloprid / abamectin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Drench / Foliar	Experiment 2: Poor control with initial drench (3.4 fl oz per 1000 pots) followed by foliar applications of Marathon II at 1.7 fl oz per 100 gal and then Avid at 8 oz per 100 gal. (Q 100%)
27686	Rotation: Marathon / Avid (Imidacloprid / abamectin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Drench / Foliar	Experiment 2: Poor control.
27688	Rotation: Safari 20SG / Avid (Dinotefuron / abamectin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Drench / Foliar	Experiment 2: Excellent control with dinotefuran drench (8 oz per 100 gal) and abamectin foliar (8 fl oz per 100 gal).
27688	Rotation: Safari 20SG / Avid (Dinotefuron / abamectin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Drench / Foliar	Experiment 2: Excellent control with dinotefuran drench (8 oz per 100 gal) and abamectin foliar not used.
27687	Rotation: Safari 20SG / Judo (Dinotefuran / spiromesefin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Drench / Foliar	Experiment 2: Excellent control with dinotefuran drench (8 oz per 100 gal); poor control with spiromesifen foliar (4 fl oz per 100 gal) applied too late.
27689	Rotation: Tristar 30SG / Sanmite (Acetamiprid / pyribdaben)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Foliar	Experiment 2: Fair to good control of adults and immatures with 4 oz / 4 oz per 100 gal foliar applications. (Q 100%)
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Classical Red'	Greenhouse	Oetting	GA	2009	Foliar	Experiment 6: Great to excellent efficacy at 6 and 8 oz per 100 gal.
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Dynasty Red'	Greenhouse	Oetting	GA	2005	Drench	Great control of adults (>90%) and excellent control of immatures (>95%) with 24 oz per 100 gal drenched at 120 ml per 6" pot.
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Advent Red'	Greenhouse	Oetting	GA	2008	Foliar	Experiment9: Good efficacy at 4 oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Red Velvet'	Greenhouse	Oetting	GA	2010	Drench	Virtually complete control of immatures and adults with 12 oz per 100 gal (Q 35%).
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Bright Red'	Greenhouse	Bethke	CA	2005	Drench	Experiment 1: Excellent efficacy at 24 oz per 100 gal
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Bright Red'	Greenhouse	Bethke	CA	2005	Drench	Experiment 3: Excellent efficacy at 8 oz per 100 gal
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Red'	Greenhouse	Bethke	CA	2005	Foliar	Experiment 1: Excellent efficacy at 8 oz per 100 gal.
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2006	Foliar	Excellent efficacy at 4 and 8 oz per 100 gal
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2009	Foliar	Experiment 2: Excellent efficacy at 8 oz per 100 gal.
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Polly Pink'	Greenhouse	Oetting	GA	2009	Foliar	Experiment 2: Good efficacy at 4 oz per 100 gal.
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Drench	Experiment 1: Excellent control with 12 oz per 100 gal drench. (Q 100%)
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Drench	Experiment 4: Great to excellent control at 3 and 6 oz per 100 gal with single drench application lasting through 58 DAT. (Q 100%)
25157	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Oetting	GA	2007	Drench	Experiment 7: Excellent control of immatures starting at 21 DAT; good control of adults with 3 and 6 oz per 100 gal. (Q 100%)

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
28245	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Pentas (Pentas sp.) 'Graffitti Violet'	Greenhouse	Oetting	GA	2008	Drench	Experiment1: Excellent control with drench at 8 and 12 fl oz per 100 gal; initial plant injury at 12 oz with complete recovery
28245	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Pentas (Pentas sp.) 'Graffitti Violet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment1: Excellent control with 4 and 8 oz; initial plant injury at 8 oz with complete recovery
28251	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens)	Greenhouse	Oetting	GA	2009	Foliar	Experiment 3: Good efficacy at 4 and 6 oz per 100 gal.
28251	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens)	Greenhouse	Oetting	GA	2009	Foliar	Experiment 4: Excellent efficacy at 6 and 8 oz per 100 gal.
28251	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Queen Scarlet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 3: Great to excellent efficacy at 6 and 8 oz per 100 gal.
28251	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Queen Scarlet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 4: Excellent efficacy at 6 and 8 oz per 100 gal.
28251	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Vista Burgundy	Greenhouse	Oetting	GA	2008	Drench	Experiment 2: Excellent control with drench at 8 and 12 fl oz per 100 gal,
28251	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens) 'Vista Burgundy'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 2: Good control with foliar at 4 and 8 oz
28248	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Wishbone Flower (Torenia sp.) 'Clown Violet'	Greenhouse	Oetting	GA	2008	Drench	Experiment1: Good to excellent control increasing with rate (8 and 12 oz).
28248	Safari 20SG (Dinotefuran)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Wishbone Flower (Torenia sp.) 'Clown Violet'	Greenhouse	Oetting	GA	2008	Foliar	Experiment1: Good to excellent control increasing with rate (4 and 8 oz).

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
25989	Safari 20SG (Dinotefuran)	Greenhouse Whitefly (Trialeurodes vaporariorum)	Marigold (Tagetes sp.) 'Queen Sophia'	Greenhouse	Davis	MI	2005	Drench	Excellent efficacy with single drench applciations at 12 and 24 oz per 100 gal.
25989	Safari 20SG (Dinotefuran)	Greenhouse Whitefly (Trialeurodes vaporariorum)	Marigold (Tagetes sp.) 'Queen Sophia'	Greenhouse	Davis	MI	2005	Foliar	Excellent efficacy with two foliar applications at 4 and 8 oz per 100 gal.
25971	Sanmite (BASF) (Pyridaben)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Advent Red'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 9: Good efficacy with 6 oz per 100 gal.
25971	Sanmite (BASF) (Pyridaben)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2009	Foliar	Experiment 2: Good efficacy on immatures with 6 oz per 100 gal.
26088	Scimitar CS (Lambda- cyhalothrin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Oetting	GA	2006	Foliar	Experiment 3: Marginal efficacy at 5 fl oz per 100 gal. (Q 83% : B 17%)
32085	SP3009 (NNI-0101) (Pyrifluquinazon)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Rapeseed/Ornamental Kale (Brassica napus) Brassica oleracea 'Crane Red'	Greenhouse	Chong	SC	2013	Foliar	Excellent control of sweetpotato whitefly (B-biotype) immatures with 1.6 and 3.2 fl oz per 100 gal applied 3 times; better than Judo and UltraFine Oil.
31632	SP3009 (NNI-0101) (Pyrifluquinazon)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2012	Foliar	Excellent control of immatures with 3.2 and 6.4 fl oz per 100 gal applied 3 times.
31632	SP3009 (NNI-0101) (Pyrifluquinazon)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Saturnis'	Greenhouse	Frank	NC	2012	Foliar	Excellent reduction of eggs and juveniles with 3.2 and 6.4 fl oz per 100 gal applied 3 times.
31518	SP3009 (NNI-0101) (Pyrifluquinazon)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Vervain (Verbena sp.) 'Superbena Royal Peechy Keen'	Greenhouse	Villavicencio	CA	2013	Foliar	Excellent control of nymphs with 1.6 and 3.2 fl oz per 100 gal applied 3 times.
26703	Sucrocide (Sucrose octanoate ester)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2006	Foliar	Fair efficacy at 0.5 to 1 gal per 100 gal; slight phytotoxicity
PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
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29639	SuffOil X (Synergy) (Petroleum Oil)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2009	Foliar	Experiment 2: Excellent efficacy at 1 gal per 100 gal.
29288	Talus 40SC (Buprofezin)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 1: Excellent control at 9 oz per 100 gal (dessication and blue sticky cards for counts).
29288	Talus 40SC (Buprofezin)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 2: Excellent control at 9 oz per 100 gal (dessication and blue sticky cards for counts).
25990	Talus 40SC (Buprofezin)	Greenhouse Whitefly (Trialeurodes vaporariorum)	Marigold (Tagetes sp.) 'Queen Sophia'	Greenhouse	Davis	MI	2005	Foliar	No to poor efficacy at 18 fl oz per 100 gal.
25975	Tame 2.4 EC (Fenpropathrin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Oetting	GA	2006	Foliar	Experiment 3: Marginal efficacy at 16 fl oz per 100 gal. (Q 83% : B 17%)
26089	Tank Mix: Avid 0.15EC + Scimitar (Abamectin + cyfluthrin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Oetting	GA	2006	Foliar	Experiment 3: Marginal to good, but variable, efficacy at 8 + 5 fl oz per 100 gal, possibly not commercially acceptable. (Q 83% : B 17%)
26087	Tank Mix: Avid 0.15EC + Tame (Abamectin + fenpropathrin)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Oetting	GA	2006	Foliar	Experiment 3: Marginal efficacy at 8 + 5 fl oz per 100 gal, possibly not commercially acceptable. (Q 83% : B 17%)
25738	TriCon (BW 420) (Sodium tetraborahydrate decahydrate)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Dynasty Red'	Greenhouse	Oetting	GA	2005	Foliar	Some initial control of adults, but in general
29286	TriStar 30SG (Acetamiprid)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 1: Excellent control at 96 g per 100 gal (dessication and blue sticky cards for counts).
29286	TriStar 30SG (Acetamiprid)	Sweet Potato Whitefly - B- biotype (Bemisia B-biotype)	Poinsettia (Euphorbia pulcherrima) 'Prestige'	Greenhouse	Parrella	CA	2006	Foliar	Experiment 2: Good control at 96 g per 100 gal (dessication and blue sticky cards for counts).

PR#	Product (Active Ingredients)	Target	Сгор	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
26085	TriStar 30SG (Acetamiprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Classical Red'	Greenhouse	Oetting	GA	2009	Foliar	Experiment 6: Good efficacy at 4 oz per 100 gal.
26085	TriStar 30SG (Acetamiprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Eckespoint Advent Red'	Greenhouse	Oetting	GA	2008	Foliar	Experiment 9: Great efficacy at 4 oz per 100 gal.
26085	TriStar 30SG (Acetamiprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Orion Red'	Greenhouse	Gilrein	NY	2009	Foliar	Experiment 2: Excellent efficacy at 5.3 oz per 100 gal.
26085	TriStar 30SG (Acetamiprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Polly Pink'	Greenhouse	Oetting	GA	2009	Foliar	Experiment 1: Great efficacy at 4 oz per 100 gal.
26085	TriStar 30SG (Acetamiprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Polly Pink'	Greenhouse	Oetting	GA	2009	Foliar	Experiment 2: Good efficacy at 4 oz per 100 gal.
29637	TriStar 30SG (Acetamiprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens)	Greenhouse	Oetting	GA	2009	Foliar	Experiment 3: Good efficacy at 4 oz per 100 gal.
29637	TriStar 30SG (Acetamiprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Sage, Scarlet (Salvia splendens)	Greenhouse	Oetting	GA	2009	Foliar	Experiment 4: Mediocre efficacy at 4 oz per 100 gal.
25991	TriStar 30SG (Acetamiprid)	Greenhouse Whitefly (Trialeurodes vaporariorum)	Marigold (Tagetes sp.) 'Queen Sophia'	Greenhouse	Davis	MI	2005	Foliar	Good to excellent efficacy at 112 and 224 g per 100 gal.
25158	TriStar 70WSP (Acetamiprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Dynasty Red'	Greenhouse	Oetting	GA	2005	Foliar	Excellent efficacy for adults and immatures starting 21 DAT with 2.25 oz per 100 gal + Capsil (Q 100%).
25158	TriStar 70WSP (Acetamiprid)	Sweet Potato Whitefly - Q- biotype (Bemisia Q-biotype)	Poinsettia (Euphorbia pulcherrima) 'Freedom Bright Red'	Greenhouse	Bethke	CA	2005	Foliar	Experiment 1: Excellent efficacy at 65 g per 100 gal

PR#	Product (Active	Target	Crop	Production	Researcher	Trial	Trial	Application	Results
	Ingredients)			Site		State	Year	Туре	
32087	Ultra Pure Oil (BASF)	Sweet Potato	Rapeseed/Ornamental	Greenhouse	Chong	TN	2013	Foliar	
	(Petroleum Oil)	Whitefly - B-	Kale (Brassica napus)						
		biotype (Bemisia	Brassica oleracaea 'Crane						
		B-biotype)	Red'						
31637	Ultra Pure Oil (BASF)	Sweet Potato	Poinsettia (Euphorbia	Greenhouse	Frank	NC	2012	Foliar	Excellent reduction of juveniles
	(Petroleum Oil)	Whitefly - B-	pulcherrima) 'Saturnis'						with 1 gal per 100 gal applied 3
		biotype (Bemisia							times.
		B-biotype)							
31520	Ultra Pure Oil (BASF)	Sweet Potato	Vervain (Verbena sp.)	Greenhouse	Villavicencio	CA	2013	Foliar	Great control of nymphs with 1
	(Petroleum Oil)	Whitefly - B-	'Superbena Royal Peechy						gal per 100 gal applied 3 times.
		biotype (Bemisia	Keen'						
		B-biotype)							
31637	Ultra Pure Oil (BASF)	TBD (TBD)	TBD (TBD) 'Orion Red'	Greenhouse	Gilrein	NY	2012	Foliar	Good control of immatures with 1
	(Petroleum Oil)								gal per 100 gal applied 3 times.
31636	Venerate (MBI 206 F)	Sweet Potato	Poinsettia (Euphorbia	Greenhouse	Frank	NC	2012	Foliar	Good reduction of eggs and
	(Burkholderia sp. strain	Whitefly - B-	pulcherrima) 'Saturnis'						juveniles with 2 gal per 100 gal
	A396)	biotype (Bemisia							applied 5 times.
		B-biotype)							
31885	Venerate (MBI 206 F)	Sweet Potato	Vervain (Verbena sp.)	Greenhouse	Villavicencio	CA	2013	Foliar	Mediocre control of nymphs with
	(Burkholderia sp. strain	Whitefly - B-	'Superbena Royal Peechy						2 gal per 100 gal applied 5 times.
	A396)	biotype (Bemisia	Keen'						
		B-biotype)							
31636	Venerate (MBI 206 F)	TBD (TBD)	TBD (TBD) 'Orion Red'	Greenhouse	Gilrein	NY	2012	Foliar	Poor control of immatures with 2
	(Burkholderia sp. strain								lb per 100 gal applied 5 times.
	A396)								

Appendix 1: Contributing Researchers

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