Environmental Horticulture Program Research Summaries

IR-4 Environmental Horticulture Program
Mite Efficacy: A Literature Review

***Aceria* sp.**
Aculops lycopersici
Aculus ligustri
Aculus schlechtendali
Epitrimerus pyri
Oligonychus ilicis
Panonychus citri
Polyphagotarsonemus latus
Raoiella indica
Tetranychus urticae

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Abstract

From 1999 to 2016, 34 active ingredients were tested mainly as foliar applications against several genera and species of mite pests on ornamentals and vegetables (Tables 1 and 2). Mite species tested included: broad mite, *Polyphagotarsonemus latus*, Eriophyid mites including *Aceria* sp., *Aculops lycopersici*, *Aculus ligustri*, *Aculus schlechtendali*, *Epitrimerus pyri*, spider mites including *Tetranychus urticae*, *Oligonychus ilicis* and *Panonychus citri*, and the red palm mite *Raoeilla indica.* Although there were insufficient data for definitive conclusions, Akari/Fujimite (fenpyroximate), Magus (fenazaquin) and Pylon (chlorfenaphyr), generally performed well on various species. Kontos/Movento/BYI 08330 (spirotetramat) looked promising on the Eriophyds *Aceria* sp. and *Aculus ligustri* and on the spider mites *P. citri* and *T. urticae*. Proclaim (emamectin benzoate) was promising on the Eriophyds *Aceria* sp. and *Aculus ligustri* and on *P. latus*. Mesa/Ultiflora (milbemectin) looked promising on the Eriophyds *A. ligustri*, *Aculus schlechtendali*, *Epitrimerus pyri* and *Aculops lycopersici*, and on the spider mites *T. urticae.* Shuttle (acequinocyl) looked promising on Southern red mite. On red palm mite, limited data indicated that Forbid/Judo (spiromesifen), Pylon, Sanmite (pyridaben), Shuttle (acequinocyl) and Sulfur/Thiolux (sulfur) performed well while Avid (abamectin), Hexygon (hexythiazox) and Tetrasan (etoxazole) were less effective. Tank-mix combination with oils generally improved mite control.

Introduction

At the IR-4 Environmental Horticulture Program Workshop in 2009, Mite Efficacy was selected as a high priority project to obtain data supporting current and future registrations was discussed. There are many different species of mites causing ornamental injuries and an extensive project may be required to generate sufficient efficacy data. We reviewed available environmental horticulture (EHC) and vegetable field trials published in Arthropod Management Tests (AMT) to detrmine efficacy of experimental and registered miticides on important ornamental mite pests. This report is a brief summary of available data from 8 EHC trials from the IR-4 Environmental Horticulture Program, and 36 EHC and vegetable trial reports published in AMT; the source of AMT report is included under each data table.

Materials and Methods

From 1999 to 2016, 34 active ingredients were tested against several genera and species of mite pests of EHC and vegetables (Tables 1 and 2). These genera/species tested included: broad mite, *Polyphagotarsonemus latus*, Eriophyid mites including *Aceria* sp., *Aculops lycopersici*, *Aculus ligustri*, *Aculus schlechtendali*, *Epitrimerus pyri*, spider mites including *Tetranychus urticae*, *Oligonychus ilicis* and *Panonychus citri*, and the red palm mite *Raoeilla indica*. Treatments were generally applied as foliar sprays. A minimum of four plants (replicate treatments) were required with most researchers exceeding this minimum. Insect counts were recorded pre-treatment and then generall at 7, 14 (prior to 2nd application), 28 and 42 days after initial application. Phytotoxicity was recorded on a scale of 0 to 10 (0 = no phytotoxicity; 10 = complete kill) at each rating date. The following protocols were used: 10-014, 10-020, 11-021 and 11-026. For more detailed materials and methods, including application rates for various products, please visit https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-researcher-resources/#Protocols to view and download these protocols.

Products were supplied to researchers (See list of researchers in Appendix 1) by their respective manufacturers.

Table 1. List of Products and Rates Tested on Environmental Horticulture Crops from 1999 to 2012.

Active Ingredient(s)	Trade Name(s)		Manufacturer	Rate(s) Tested		# Trials
	Food Use	Orn.Hort./Turf Use				
Abamectin	Agri-Mek, Avid	Minx	Syngenta	Spray	4 fl oz per 100 gal 8 fl oz per 100 gal 12 fl oz per 100 gal	12
Acephate	Orthene	Orthene	Valent	Spray	1 lb per 100 gal	1
Acequinocyl	Kanemite	Shuttle	Arysta	Spray	6.4 fl oz per 100 gal 12.8 fl oz per 100 gal 31 fl oz per acre	3
Acetamiprid	Assail	Tristar	Cleary, UPI	Spray	112 g per 100 gal 224 g per 100 gal 2.3 oz per 100 gal	2
BAS 92102		BAS 92102	BASF	Spray	13.7 fl. oz per 100 gal	1
Bifenazate	Acramite	Floramite	Chemtura, OHP	Spray	4 fl oz per 100 gal 8 fl oz per 100 gal	4
Buprofezin	Applaud	Talus	Nichino, SePro	Spray	18 fl oz per 100 gal	1
Chlorfenaphyr	Pylon	Pylon	BASF	Spray	2.6 fl oz per 100 gal 4 fl oz per 100 gal 5.2 fl oz per 100 gal 5.6 fl oz per 100 gal	8
Chromobacterium subtsugae NRRL B-30655.	MBI 203	MBI 203	Marrone	Spray	1 % solution 5 % solution	1
Cinnamaldehyde		Cinnamite	Mycotech	Spray	85 fl oz per 100 gal	1
Clofentezine		Ovation	Scotts	Spray	2 fl oz per 100 gal 8 fl oz per 100 gal	2
Dinotefuran	Venom	Safari	Valent	Drench	12 oz per 100 gal 24 oz per 100 gal 2.84 oz per 100 gal	2
				Spray	4 oz per 100 gal 8 oz per 100 gal	1
Emamectin Benzoate	Proclaim		Syngenta	Spray	4 oz per 100 gal 8 oz per 100 gal	3
Etoxazole	Zeal	Tetrasan	Valent	Spray	10 oz per 100 gal 16 oz per 100 gal	3

Active Ingredient(s)	Trade Name(s)		Manufacturer	Rate(s) Tested		# Trials
	Food Use	Orn.Hort./Turf Use				
Fenazaquin	Magus	Magus	Gowan	Spray	12 fl oz per 100 gal 16 fl oz per 100 gal 18 fl oz per 100 gal 20 fl oz per 100 gal 24 fl oz per 100 gal	6
Fenpyroximate	Fujimite, Portal	Akari	Nichino, SePro	Spray	24 fl oz per 100 gal	3
Flonicamid	Beleaf	Aria	FMC	Spray	60 g per 100 gal 120 g per 100 gal	1
Hexythiazox	Onager, Savey	Hexygon	Gowan	Spray	1 oz per 100 gal 2 oz per 100 gal	5
Metarhizium anisophliae	Tick Ex	Tick Ex	Novozymes	Spray	29 fl oz per 100 gal	1
Milbemectin	Mesa	Ultiflora	Gowan	Spray	12 fl oz per 100 gal 16 fl oz per 100 gal	5
Petroleum Oil	SuffOil X	SuffOil X	BioWorks	Spray	1 gal per 100 gal 2 gal per 100 gal	2
	Ultra-Pure Spray Oil	Ultra-Pure Spray Oil	Various	Spray	100 fl oz per 100 gal	1
Potassium salts of fatty acids	M-Pede	M-Pede	Gowan	Spray	2 gal per 100 gal	1
Pyridaben	Pyramite	Sanmite	BASF	Spray	4 oz per 100 gal 6 oz per 100 gal	3
Spinosad	Conserve	Conserve	Dow	Spray	20 fl oz per 100 gal	1
Spiromesifen	Oberon	Forbid, Judo	Bayer, OHP	Spray	2 fl oz per 100 gal	1
Spirotetramat	Movento	Kontos, BYI 08330	Bayer, OHP	Drench	50 ml per 1100 pots 0.38 fl oz per 100 gal 0.64 fl oz per 100 gal 0.96 fl oz per 100 gal 1.28 fl oz per 100 gal	2
				Spray	1.7 fl oz per 100 gal 2.5 fl oz per 100 gal 3.4 fl oz per 100 gal	4
Sulfur	Microthiol Disperss	Microthiol Disperss, Sulfur, Thiolux	UPI, etc.	Spray	2.5 gal per 100 gal 10 lb per 100 gal	2
Thiamethoxam	Platinum	Flagship, Meridian	Syngenta	Spray	1 oz per 100 gal 2 oz per 100 gal 4 oz per 100 gal	2

Table 2. List of Products and Rates Tested on Food Crops from 2002 to 2016.

Active Ingredient(s)	Trade Name(s)		Manufacturer	Rate(s) Tested		# Trials
	Food Use	Orn.Hort./Turf Use				
Abamectin	Agri-Mek, Avid	Minx	Syngenta	Spray	8 fl oz per acre 10 fl oz per acre 12 fl oz per acre 16 fl oz per acre	12
Acequinocyl	Kanemite	Shuttle	Arysta	Spray	31 fl oz per acre 46.5 fl oz per acre	4
Bifenazate	Acramite	Floramite	Chemtura, OHP	Spray	0.5 lb per acre 0.75 lb per acre 1 lb per acre	6
Cyflumetofen	Nealta	Sultan	BASF	Spray	13.7 fl oz per acre	2
Emamectin Benzoate	Proclaim		Syngenta	Spray	3.6 oz per acre 8 oz per acre	2
Etoxazole	Zeal	Tetrasan	Valent	Spray	2 oz per acre	2
Fenazaquin	Magister		Gowan	Spray	24 fl oz per acre 32 fl oz per acre	1
Fenpyroximate	Fujimite	Akari	Nichino, SePro	Spray	30.5 fl oz per acre 32 fl oz per acre	4
Geraniol, citronellol, nerolidol, and farnesol	Biomite	Biomite	Natural Plant		1 pt per acre 2 pt per acre 3 pt per acre	1
Lambda-cyhalothrin + thiamethoxam	Endigo		Syngenta	Spray	3 fl oz per acre 6 fl oz per acre	2
Milbemectin	Mesa	Ultiflora	Gowan	Spray	16 fl oz per acre 20 fl oz per acre 25 fl oz per acre 30 fl oz per acre 36 fl oz per acre	7
Oxamyl	Vydate		DuPont	Spray	2 qt per acre	1
Petroleum Oil	SuffOil X	SuffOil X	BioWorks	Spray	2 gal per 100 gal	1
Pyridaben	Pyramite	Sanmite	BASF	Spray	6.6 oz per acre 7 oz per acre	3

Active Ingredient(s)	Trade Name(s)		Manufacturer	Rate(s) Tested		# Trials
	Food Use	Orn.Hort./Turf Use				
Spirodiclofen	Envidor		Bayer	Spray	7 fl oz per acre 8.75 fl oz per acre 11 fl oz per acre 14 fl oz per acre 18 fl oz per acre 16 fl oz per acre 20 fl oz per acre	8
Spiromesifen	Oberon	Forbid, Judo	Bayer, OHP	Spray	8.5 fl oz per acre 12.8 fl oz per acre	3
Spirotetramat	Movento	Kontos, BYI 08330	Bayer, OHP	Spray	5 fl oz per acre 10 fl oz per acre	2
Tolfenpyrad	Torac	Hachi-Hachi	Nichino	Spray	14 fl oz per acre 21 fl oz per acre	3

Results and Summary

Comparative Efficacy on Broad Mites

The broad mite, *Polyphagotarsonemus latus*, (family *Tarsonemidae*) is distributed world-wide and has a large host range in Australia, Asia, Africa, Europe, North America, South America, and the Pacific Island. Broad mites infest food crops and many ornamentals, including African violet, ageratum, azalea, begonia, chrysanthemums, cyclamen, dahlia, gerbera, gloxinia, ivy, jasmine, impatiens, lantana, marigold, pittosporum, snapdragon, verbena and zinnia. It is considered a serious pest of *Pittosporum* spp. in Florida. This destructive pest causes terminal leaves and flower buds to become malformed. The mite's toxic saliva causes twisted, hardened and distorted growth in the terminal of the plant.

Gilrein 2009

In 2010, Gilrein conducted an experiment to examine various products for control of broad mites on New Guinea impatiens (Table 3). Avid, Proclaim, Pylon and the Pylon + oil combinations, provided the greatest level of of initial and residual control. Kontos drench or foliar, Magus and SuffOil X provided less residual activity, and MBI 203 was ineffective. Plants treated with the Pylon + Ultra-Pure oil combination showed severe leaf burn and bud injury after the second application; Pylon + Suffoil also showed slight leaf burn, primarily at the leaf tips. No other treatments exhibited any signs of phytotoxicity.

Schuster 2002-2007

From 2002, 2003, 2005 and 2007, Schuster conducted 4 experiments to examine various miticides for efficacy on broad mite (*Polyphagotarsonemus latus*) on bell pepper (*Capsicum annuum*). The products tested included Acramite, Agri-Mek, Fujimite, Mesa, Microthiol Disperss and Oberon. In 2002, Agri-Mek, Fujimite and Oberon at the 2 higher rates mixed with Induce surfactant provided good to excellent control of heavy infestations, better than Acramite and Microthiol Disperss (Table 4). In 2003, Agri-Mek, Mesa and Oberon provided good to excellent control of heavy infestations, better than Acramite (Table 5). In 2005, Agri-Mek and Oberon provided good to excellent control of moderate infestations (Table 6). Both treatments in 2007 (Agri-Mek and Mesa) provided good to excellent control of heavy infestations (Table 7).

Table 3. Efficacy on Broad mite (*Polyphagotarsonemus latus*) on New Guinea Impatiens (*Impatiens x hawkerii)* 'Celebrette Purple', Gilrein, NY, 2010.

Treatment	Rate Per 100 Gal	Applic. Dates	Number of Mites Per Plant[x]					Phyto Rating[y] 1/6/11
			Pretreatment 12/7/10	12/14/10	12/21/10	12/28/10	1/4/11	
Avid 0.15EC (abamectin)	8 fl oz	12/10, 12/20	8.1 a	0.1 e (99)	0.1 d (99)	-	0.0 g (100)	0.0 c
Kontos 2SC (spirotetramat) drench	50 ml/1100 pots	12/10	7.6 a	16.4 a (11)	3.3 cd (80)	-	2.6 efg (79)	0.0 c
Kontos 2SC	3.4 fl oz	12/10, 12/24	8.3 a	6.5 a-d (68)	5.6 bc (69)	4.0 b (80)	4.5 d-g (67)	0.2 c
Magus 1.6SC (fenazaquin)	12 fl oz	12/10	8.4 a	4.3 b-e (79)	4.3 cd (77)	-	11.8a-d (15)	0.0 c
Magus 1.6SC	24 fl oz	12/10	7.5 a	0.9 de (95)	2.3 cd (86)	-	5.9 c-f (53)	0.1 c
MBI 203 EP (*Chromobacterium subtsugae)*	5 %	12/10, 12/20	9.4 a	15.1 abc (34)	13.6 ab (34)	-	15.1 ab (3)	0.1 c
MBI 203 EP	1 %	12/10, 12/20	7.5 a	11.0 ab (40)	13.8 (16)ab	-	20.9 a (0)	0.0 c
Proclaim 5SG (emamectin benzoate)	4 oz	12/10, 12/20	9.8 a	2.0 cde (92)	0.9 d (96)	-	0.4 fg (98)	0.0 c
Proclaim 5SG	8 oz	12/10, 12/20	7.3 a	1.3 de (93)	0.4 d (98)	-	0.4 fg (97)	0.0 c
Pylon 2SC (chlorfenaphyr)	5.6 fl oz	12/10, 12/20	10.1 a	0.6 de (100)	0.1 d (99)	-	0.1 g (99)	0.0 c
Pylon 2SC + Ultra-Pure Oil	5.6 fl oz + 1 %	12/10, 12/20	8.0 a	0.0 e (100)	0.1 d (99)	-	0.3 fg (98)	6.4 a
Pylon 2SC + Suffoil X	5.6 fl oz + 1 %	12/10, 12/20	7.6 a	0.0 e (100)	0.4 d (98)	-	0.1 g (99)	1.1 b
Suffoil X	1 %	12/10, 12/20	8.0 a	2.3 de (88)	1.3 cd (93)	-	8.6 b-e (35)	0.0 c
Untreated	-	-	8.8 a	21.4 a (0)	19.3 a (0)	21.4 a (0)	14.6 abc (0)	0.0 c
			Number of Eggs Per Plant[x]					
Avid 0.15EC (abamectin)	8 fl oz	12/10, 12/20	10.4 a	1.0 def (94)	0.1 e (99)	-	0.0 g (100)	
Kontos 2SC (spirotetramat) drench	50 ml/1100 pots	12/10	10.6 a	7.8 a-d (71)	1.1 de (90)	-	0.4 efg (95)	
Kontos 2SC	3.4 fl oz	12/10, 12/24	7.9 a	4.6 b-f (62)	5.5 bcd (30)	2.8 b (67)	2.6 def (56)	
Magus 1.6SC (fenazaquin)	12 fl oz	12/10	17.3 a	7.8 b-e (71)	9.3 (46)abc	-	12.3 a-d (2)	

Treatment	Rate Per 100 Gal	Applic. Dates	Number of Mites Per Plant[x]					Phyto Rating[y] 1/6/11
			Pretreatment 12/7/10	12/14/10	12/21/10	12/28/10	1/4/11	
Magus 1.6SC	24 fl oz	12/10	12.9 a	2.4 def (88)	3.4 c (74)de	-	9.1 cde (6)	
MBI 203 EP (*Chromobacterium subtsugae)*	5 %	12/10, 12/20	13.4 a	17.1 ab (17)	19.3a (0)	-	17.6 ab (0)	
MBI 203 EP	1 %	12/10, 12/20	10.6 a	11.9 abc (27)	17.5ab (0)	-	20.0 a (0)	
Proclaim 5SG (emamectin benzoate)	4 oz	12/10, 12/20	11.9 a	2.0 def (89)	1.4 de (88)	-	0.0 g (100)	
Proclaim 5SG	8 oz	12/10, 12/20	12.9 a	0.9 ef (95)	0.3 e (98)	-	0.0 g (100)	
Pylon 2SC (chlorfenaphyr)	5.6 fl oz	12/10, 12/20	14.8 a	2.4 c-f (89)	0.8 e (95)	-	0.0 g (100)	
Pylon 2SC + Ultra-Pure Oil	5.6 fl oz + 1 %	12/10, 12/20	11.6 a	1.5 def (92)	0.3 e (97)		0.0 g (100)	
Pylon 2SC + Suffoil X	5.6 fl oz + 1 %	12/10, 12/20	8.6 a	0.3 f (98)	0.6 e (93)	-	0.0 g (100)	
Suffoil X	1 %	12/10, 12/20	10.3 a	2.9 c-f (82)	2.4 de (77)	-	8.9 b-e (0)	
Untreated	-	-	17.0 a	26.1 a (0)	17.0 ab (0)	18.0 a (0)	12.8 abc (0)	

[x] Means followed by same letter do not differ significantly based on Tukey's HSD (P=0.05).

[y] Phyto rating: scale of 0 to 10 (0 = no phytotoxicity; 10 = complete kill).

Table 4. * Efficacy on Broad mite (*Polyphagotarsonemus latus*) on Bell Pepper (*Capsicum annuum*) 'Brigade', Fall 2002, Schuster, FL, 2002.

Treatment	Rate Per Acre	Number Per 10 Plants								Damage Rating [x]
		Pre-spray		3 DAT1		7 DAT1		3 DAT2		
		Eggs	Motiles	Eggs	Motiles	Eggs	Motiles	Eggs	Motiles	
Acramite 50WS (bifenazate)	1 lb	68	49	125	42	615	76	1335	151	4.5
Agri-Mek 0.15EC (abamectin)	8 fl oz	74	57	6	1	4	3	2	0	1.0
Fujimite SC (fenpyroximate)	30.5 fl oz	194	105	18	2	83	20	29	3	1.3
Microthiol Disperss (sulfur)	8 lb	70	52	178	30	529	56	1146	84	2.7
Oberon 240SC (spiromesifen) + Induce	7 fl oz	90	68	76	9	197	24	71	17	1.5
	8.5 fl oz	203	94	10	4	50	8	54	12	1.1
	12 fl oz	173	132	6	3	44	2	35	5	
Untreated	-	232	150	333	64	811	111	2019	90	5.0
LSD P = 0.05	-	215	100	157	26	186	46	310	80	0.2

* Not an IR-4 Experiment: Arthropod Management Tests Vol 29: E54.

[x] Damage rating: 1 = no injury, 2 = light leaf curling and elongation (strapping), 3 = moderate leaf curling and strapping , 4 = heavy leaf curling and strapping, and 5 = death of terminal and lateral growing points.

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Table 5. * Efficacy on Broad mite (*Polyphagotarsonemus latus*) on Bell Pepper (*Capsicum annuum*) 'Brigadier', Schuster, FL, 2003.

Treatment	Rate Per Acre	Number Motiles Per 10 Plants[x]						Damage Rating[y]
		3 DAT1	7 DAT1	3 DAT2	7 DAT2	14 DAT2	21 DAT2	
Acramite 50WS (bifenazate)	1 lb	127 a	111 a	134 ab	7 b	22 b	7 ab	3.7 b
Agri-Mek 0.15EC (abamectin)	8 fl oz	16 d	2 c	1 c	0 c	1 c	1 b	1.3 de
Oberon 240SC (spiromesifen) + Induce	8.5 fl oz + 0.05% v/v	22 c	5 c	13 c	1 c	7 c	6 a	1.2 de
Untreated	-	96 ab	129 a	95 b	20 a	91 a	14 a	4.3 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 30: E49. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).
[y] Damage rating: 1 = no injury, 2 = light leaf curling and elongation (strapping), 3 = moderate leaf curling and strapping , 4 = heavy leaf curling and strapping, and 5 = death of terminal and lateral growing points.

Table 6. * Efficacy on Broad mite (*Polyphagotarsonemus latus*) on Bell Pepper (*Capsicum annuum*) 'Brigadier', Schuster, FL, 2005.

Treatment	Rate Per Acre	Number Motiles Per 10 Leaves [x]							
		0 DAT1	3 DAT1	7 DAT1	14 DAT1	4 DAT2	7 DAT2	15 DAT2	22 DAT2
Agri-Mek 0.15EC (abamectin)	8 fl oz	13 a	1 b	0 b	2 b	3 b	0 b	3 b	3 a
Oberon 240SC (spiromesifen) + Induce	8.5 fl oz	28 a	1 b	5 b	9 b	4 b	5 b	4 b	3 a
Untreated	-	13 a	10 a	64 a	55 a	23 a	50 a	23 a	6 a
LSD (*P* = 0.05)		17	5	42	41	17	30	17	5

* Not an IR-4 Experiment: Arthropod Management Tests Vol 31: E45.
[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).

Table 7. * Efficacy on Broad mite (*Polyphagotarsonemus latus*) on Bell Pepper (*Capsicum annuum*) 'Revolution', Schuster, FL, 2007.

Treatment	Rate Per Acre	Number Motiles Per 10 Plants[x]						
		3 DAT1	6 DAT1	13 DAT1	4 DAT2	12 DAT2	20 DAT2	33 DAT
Agri-Mek 0.15EC (abamectin)	8 fl oz	3 b	1 b	6 b	0 b	0 b	1 b	3 b
Mesa (milbemectin)	16 fl oz	2 b	0 b	2 b	0 b	0 b	0 b	6 b
Untreated	-	23 a	32 a	29 a	25 a	54 a	82 a	42 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 34: E46. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).

Liu 2003

In this experiment, Liu examined several products including Agri-Mek, Proclaim and Vydate for efficacy on broad mite on bell pepper. The standard Agri-Mek provided the best control, followed by Vydate and Proclaim (Table 8).

Table 8. * Efficacy on Broad mite (*Polyphagotarsonemus latus*) on Bell Pepper (*Capsicum annuum*) 'Jupiter', Liu, TX, 2003.

Treatment	Rate Per Acre	Application Date(s)	No. Mites[x] Per 4 cm^2	Damage Rating[y]
Agri-Mek 0.15EC (abamectin)	16 fl oz	9/29, 10/14	0.80 d	0.10 d
Proclaim 5SG (emamectin benzoate)	3.6 oz	10/20	7.20 ab	3.82 c
Vydate 2L (oxamyl)	2 qt	10/14	2.83 d	3.42 c
Untreated	-	-	9.53 a	4.90 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 30: E47. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).
[y] Damage rating: 0 = no damage, 1 = minor feeding damage, 2 = minor-moderate feeding damage, 3 = moderate damage, 4 = moderate-heavy damage, and 5 = heavy damage.

Stansly 2010-2014

From 2010 to 2014, Stansly conducted 4 experiments to examine several products for efficacy on broad mite (*Polyphagotarsonemus latus*) on bell and jalapeno peppers (*Capsicum annuum*). The products tested included Agri-Mek, Abba Ultra, Grandevo, MBI-206, Movento, Oberon, Portal, Requiem and Torac. In 2010, both Movento and Oberon effectively reduced the number of adults and nymphs, as well as eggs throughout the trial (Table 9). Similarly in 2011, both treatments provided effective control, resulting in reduced leaf damage (Table 10). In 2013, all treatments resulted in significant broad mite reduction and damage, with Zeal, Grandevo and Movento showing the lowest damage rating (Table 11). In 2014, all treatments (Abba Ultra, Oberon, Portal and Torac) effectively reduced broad mite population (Table 12).

Smith 2012

In this experiment, Smith examined several products including Agri-Mek, Torac and Zeal for efficacy on broad mite on bell pepper. Agri-Mek and Torac, both applied 3 times, provided excellent control (Table 13). Zeal applied once provided good to excellent control but not as long lasting.

Table 9. * Efficacy on Broad mite (*Polyphagotarsonemus latus*) on Jalapeno Pepper (*Capsicum annuum*) 'Tormento', Stansly, FL, 2010.

Treatment [y]	Rate Per Acre	No. Nymphs + Adults Per Leaf [x]				No. Eggs Per Leaf			
		Nov 8	Nov 15	Nov 22	Nov 29	Nov 8	Nov 15	Nov 22	Nov 29
Movento (spirotetramat)	5 fl oz	0.13 b	0.03 b	0.00 b	0.03 b	0.18 b	0.00 b	0.03 b	0.00 b
Oberon 240SC (spiromesifen)	8.5 fl oz	0.80 b	1.03 b	0.03 b	0.03 b	1.80 b	1.02 ab	0.00 b	0.00 b
Untreated	-	3.78 a	4.05 a	4.0 8a	3.13 a	6.23 a	2.22 a	4.65 a	1.80 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 37: E42.

[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).

[y] Treatments sprayed on Nov 2 and 11.

Table 10. * Efficacy on Broad mite (*Polyphagotarsonemus latus*) on Jalapeno Pepper (*Capsicum annuum*) 'Tormento', Stansly, FL, 2011.

Treatment	Rate Per Acre	Applic Dates	No. Per Leaf [x]						Damage Rating [y]
			10/26	11/2	11/9	11/15	11/22	11/29	12/1
Mites									
Agri-Mek 0.15EC (abamectin) alt. Movento (spirotetramat)	2.5 fl oz 5 fl oz	10/24, 11/7 10/28, 11/14	0.94 b	4.29 b	0.65 b	0.06 b	0.88 b	1.73 a	0.95 b
Tolfenpyrad 15EC + Induce	21 fl oz	10/24, 28, 11/7, 14	1.03 b	2.48 b	0.53 b	0.15 b	0.08 b	0.56 bc	0.73 b
Tolfenpyrad 15EC + Induce	14 fl oz	10/24, 28, 11/7, 14	1.06 b	4.71 b	0.30 b	0.00 b	0.04 b	0.15 c	0.56 b
Untreated	-	-	4.81 a	26.68 a	15.52 a	7.13 a	3.92 a	1.04 ab	3.29 a
Mite Eggs									
Agri-Mek 0.15EC (abamectin) alt. Movento (spirotetramat)	2.5 fl oz 5 fl oz	10/24, 11/7 10/28, 11/14	2.28 b	8.15 b	3.70 b	0.29 b	1.04 b	1.70 a	
Tolfenpyrad 15EC + Induce	21 fl oz	10/24, 28, 11/7, 14	5.00 ab	2.77 b	0.93 b	2.31 b	0.02 b	0.50 bc	
Tolfenpyrad 15EC + Induce	14 fl oz	10/24, 28, 11/7, 14	7.84 a	2.81 b	2.13 b	0.52 b	0.00 b	0.13 c	
Untreated	-	-	8.75 a	36.17 a	17.95 a	8.33 a	3.44 a	1.38 ab	

* Not an IR-4 Experiment: Arthropod Management Tests Vol 38: E44.

[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).

[y] Damage to leaves rated at 0-5 where 0 = no damage, 1 = < 5%, 2 = 6-25%, 3 = 26-50%, 4 = 50-75%, and 5 = >76%.

Table 11. * Efficacy on Broad mite (*Polyphagotarsonemus latus*) on Bell Pepper (*Capsicum annuum*) 'Seminis 8302', Stansly, FL, 2013.

Treatment [z]	Rate Per Acre	Applic Dates	No. Per Leaf [x]					Damage Rating [y] 6/13
			5/15	5/22	5/31	6/5	6/12	
Grandevo (*Chromobacterium subtsugae* strain PRAA4-1[T)]	1.5 lb	5/13, 20, 29, 6/3, 10	10.45 c-f	15.83 bc	3.70 b	7.35 cde	6.88 cd	2.35 d
	2 lb		15.00 bcd	13.03 b-e	3.15 bc	6.40 de	4.83 cd	2.83 b
MBI 206 (*Burkholderia* sp. strain A396)	2.0 gal	5/13, 20, 29, 6/3, 10	15.23 bcd	18.88 b	4.53 b	11.35 bcd	9.93 bc	3.50 a
Movento 2SC (spirotetramat)	5.0 oz	5/13, 20	3.78 ef	8.18 def	2.50 bc	16.73 ab	21.18 a	2.38 cd
Requiem 25EC (extract of Chenopodium ambrosioides)	2 qt	5/13, 20, 29, 6/3, 10	3.40 ef	3.45 f	3.93 b	7.53 cde	6.10 cd	2.73 b
Zeal (etoxazole)	2.0 oz	5/13, 20, 29, 6/3, 10	7.28 df	5.68 f	3.70 b	6.43 d	5.25 cd	2.35 d
	3.0 oz		2.30 f	7.38 def	3.23 bc	6.00 df	2.93 d	2.18 d
Untreated	-	-	32.3 a	37.6 a	9.55 a	17.00 a	15.03 ab	3.45 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 39: E67. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).
[y] Damage to leaves rated at 0-4 where 0 = no damage, 1 = < 5%, 2 = 6-33%, 3 = 34-67%, and 4 = >68%.
[z] All products, except Requiem, mixed with Induce surfactant at 0.25% v/v.

Table 12. * Efficacy on Broad mite (*Polyphagotarsonemus latus*) on Bell Pepper (*Capsicum annuum*) 'Seedway 48', Stansly, FL, 2014.

Treatment [y]	Rate Per Acre	No. Nymphs + Adults Per Leaf [x]			No. Eggs Per Leaf		
		May 9	May 16	May 23	May 9	May 16	May 23
Abba Ultra (abamectin)	5.0 oz	0.03 b	0.00 b	0.08 b	0.03 b	0.03 b	0.00 b
Oberon 2 SC (spiromesifen)	8.5	0.00 b	0.00 b	0.05 b	0.00 b	0.00 b	0.05 b
Portal 5 EC (fenpyroximate)	32 oz	0.00 b	0.00 b	0.00 b	0.00 b	0.00 b	0.00 b
Torac 15 EC (tolfenpyrad)	14 oz	0.00 b	0.00 b	0.03 b	0.00 b	0.05 b	0.00 b
Untreated	-	1.18 a	6.93 a	10.05 a	3.13 a	6.85 a	6.85 a

* Not an IR-4 Experiment: Arthropod Management Tests 2017. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).
[y] Treatments sprayed on May 3, 10 and 17. All products mixed with Dyn-Amic at 0.25% v/v.

Table 13. * Efficacy on Broad mite (Polyphagotarsonemus latus) on Bell Pepper (Capsicum annuum) 'Aristotle', Smith, FL, 2012.

Treatment [y]	Rate Per Acre	Applic Dates	No. Per 10 Leaves [x]					
			10/5	10/17	10/23	10/31	11/22	11/29
Adults								
Agri-Mek 0.15EC (abamectin)	3.5 fl oz	10/12, 18, 25	0.3 a	0.0 c	0.3 bc	0.0 b	0.0 b	0.0 b
Torac 15EC (tolfenpyrad)	17 fl oz	10/12, 18, 25	0.3 a	0.0 c	0.0 c	0.0 b	0.0b	0.8 b
Torac 15EC (tolfenpyrad)	14 fl oz	10/12, 18, 25	0.0 a	0.0 c	0.0 c	0.0 b	0.0b	0.0 b
Zeal 72 WP (etoxazole)	3.0 oz	10/12	2.8 a	1.8 c	5.0 b	13.8 a	15.5 a	18.5 a
Untreated	-	-	9.8 a	42.8 ab	47.5 a	8.0 a	8.5 a	16.3a
Nymphs								
Agri-Mek 0.15EC (abamectin)	3.5 fl oz	10/12, 18, 25	0.3 a	0.0 c	0.0c	0.0 b	0.0 b	0.0 c
Torac 15EC (tolfenpyrad)	17 fl oz	10/12, 18, 25	0.3 a	0.0 c	0.0c	0.0 b	0.0 b	1.0 c
Torac 15EC (tolfenpyrad)	14 fl oz	10/12, 18, 25	0.3 a	0.0 c	0.0c	0.0 b	0.0 b	1.0 c
Zeal 72 WP (etoxazole)	3.0 oz	10/12	2.8 a	1.3 c	19.8b	33.8 a	26.5 a	46.5 a
Untreated	-	-	9.8 a	91.3 ab	148.0a	22.0 a	12.5 a	36.0 a
Eggs								
Agri-Mek 0.15EC (abamectin)	3.5 fl oz	10/12, 18, 25	0.0 a	0.0 d	0.0 c	0.0 b	0.3 b	0.0 b
Torac 15EC (tolfenpyrad)	17 fl oz	10/12, 18, 25	0.0 a	0.0 d	1.3 c	0.0 b	0.3 b	1.0 b
Torac 15EC (tolfenpyrad)	14 fl oz	10/12, 18, 25	0.5 a	2.3 d	0.0 c	0.0 b	0.3 b	0.0 b
Zeal 72 WP (etoxazole)	3.0 oz	10/12	3.5 a	41.5 cd	78.8 b	72.0 a	83.5 a	84.8 a
Untreated	-	-	33.8 a	482.3 ab	520.0 a	54.0 a	32.8 a	65.3 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 39: E14.

[x] Means followed by same letter do not differ significantly based on Fisher's ProtectedLSD (P=0.05).

[y] All treatments mixed with Induce at 0.25% v/v.

Comparative Efficacy on Eriophyid Mites

Eriophyid mites (family Eriophyidae), also known as blister, bud, gall, and rust mites, attack a wide range of ornamental plants, including ash, cherry, crabapple, elm, fir, hemlock, maples, spruce and walnut. They feed deep within the plant tissues (meristematic region), sucking out plant juices with their styletlike mouthparts and transferring a substance or toxin, which causes deformation or abnormalities in the manner they are named for. They usually do not cause serious injury, even large populations can be tolerated by plants, but the damage may be unsightly. Additionally, Eriophyid mites are the only group of mites known to transmit plant viruses.of plant growth.

Aceria sp. In 2011, Grasswitz conducted an experiment to examine various products applied foliar on New Mexico olive trees that were naturally infested with an undescribed species of *Aceria* (Acari: Eriophyidae) that causes the margin of affected leaves to curl downwards, enclosing the mites within (Table 14). Kontos, Magus and Proclaim generally provided control comparable to the standard Avid® + 1% SuffOil X; Akari, and Ultiflora were less effective, and Hexygon did not significantly reduce mite infestation. No phytotoxicity was observed in any treatment.

Rust Mites. In 2011, Uber conducted an experiment to examine efficacy of Akari, Avid, Hexygon, Kontos, Magus, Proclaim, Pylon, Tick Ex and Ultiflora applied foliar on hedge privet rust mites (*Aculus ligustri*) on variegated privet. All treatments except Hexygon provided excellent control by 21 day after the first application; with Akari, Proclaim and Tick Ex providing slightly lower initial control (Table 15). Hexygon was generally ineffective.

Table 14. * Efficacy on Eriophyid mite Aceria sp. on New Mexico Olive (Forestiera pubescens var. pubescens) Grasswitz, NM, 2011.

Treatment	Rate Per 100 Gal	Applic. Dates	Number of Mites Per Leaf[x] (Henderson's % Control)					
			0 DAT	7 DAT*	14 DAT	21 DAT	28 DAT	35 DAT
Akari (fenpyroximate)	24 fl oz	7/20, 8/3	174.4 a	26.0 b (66)	9.6 bcd (57)	12.2 c (67)	7.2 a (47)	11.9 a (0)
Avid 0.15EC (abamectin) + SuffOil X	8 fl oz + 1%	7/20, 7/27	151.8 a	11.5 bc (83)	8.1 d (58)	7.6 c (76)	7.5 a (37)	15.7 a (0)
Hexygon (hexythiazox)	2 oz	7/19	150.3 a	67.3 a (0)	56.9 a (0)	28.3 b (11)	41.7 a (0)	30.9 a (0)
Kontos 2SC (spirotetramat)	3.4 fl oz	7/20, 8/3	152.4 a	28.9 b (57)	5.3 d (73)	7.2 c (78)	4.9 a (59)	7.0 a (0)
Magus 1.6SC (fenazaquin)	24 fl oz	7/20	144.9 a	9.0 c (86)	3.8 d (79)	5.4 c (82)	7.1 a (38)	5.8 a (0)
Proclaim 5SG (emamectin benzoate)	4 oz	7/19, 7/26	141.3 a	26.8 b (57)	5.1 d (72)	3.1 c (90)	5.8 a (48)	9.7 a (0)
Proclaim 5SG	8 oz	7/19, 7/26	158.0 a	29.5 b (57)	5.5 d (73)	7.0 c (79)	5.4 a (56)	13.0 a (0)
Ultiflora (milbemectin)	16 fl oz	7/19, 8/2	145.2 a	24.2 b (62)	12.6 bc (32)	13.2 abc (57)	7.5 a (34)	18.4 a (0)
Untreated	-	-	151.6 a	66.2 a (0)	19.3 ab (0)	32.1 ab (0)	11.9 a (0)	5.7 a (0)

* DAT refers to days after the first application of any product.

[x] Means followed by same letter do not differ significantly based on Kruskal-Wallis analysis of medians followed by pair-wise comparisons using the Mann-Whitney test (P=0.05).

Table 15. * Efficacy on Hedge Privet Rust Mite (*Aculus ligustri*) on Variegated Privet (*Ligustrum sinense*), Uber, CA, 2011.

Treatment	Rate Per 100 Gal	Number of Mites Per Leaf[x] (Henderson's % Control)						
		-1 DAT	3 DAT	7 DAT	10 DAT	13 DAT	21 DAT	27 DAT
Akari (fenpyroximate)	24 fl oz	231.0 c	96.0 bc (41)	90.0 bc (54)	24.0 c (86)	9.0 c (97)	0.0 c (100)	9.0 c (99)
Avid 0.15EC (abamectin) + Oil	4 fl oz + 1%	837.0 a	63.0 b-e (91)	21.0 c (97)	12.0 c (98)	9.0 c (99)	12.0 c (99)	3.0 c (100)
Hexygon (hexythiazox)	2 oz	456.0 bc	111.0 b (70)	132.0 b (66)	363.0 a (0)	417.0 a (19)	474.0 b (59)	575.5 b (42)
Kontos 2SC (spirotetramat)	3.4 fl oz	456.0 bc	81.0 b-e (78)	60.0 bc (84)	30.0 c (91)	18.0 bc (97)	9.0 c (99)	3.0 c (100)
Magus 1.6SC (fenazaquin)	24 fl oz	363.0 bc	51.0 cd (83)	57.0 bc (81)	27.0 c (90)	15.0 bc (96)	12.0 c (99)	12.0 c (99)
Proclaim 5SG (emamectin benzoate)	4 oz	192.0 c	33.0 e (79)	39.0 c (76)	24.0 c (83)	9.0 c (96)	12.0 c (98)	6.0 c (99)
Proclaim 5SG	8 oz	147.0 c	39.0 de (68)	36.0 c (71)	27.0 c (75)	15.0 bc 91()	12.0 c (97)	3.0 c (99)
Pylon 2SC (chlorfenaphyr)	2.6 fl oz	459.0 bc	51.0 cde (86)	45.0 bc (88)	9.0 c (97)	9.0 c (98)	6.0 c (99)	36.0 c (97)
Tick Ex (*Metarhizium anisophliae)*	29 fl oz	489.0 abc	93.0 bcd (77)	240.0 a (42)	84.0 c (77)	114.0 b (79)	60.0 c (95)	30.0 c (98)
Ultiflora (milbemectin)	16 fl oz	684.0 ab	42.0 cde (92)	48.0 bc (92)	21.0 c (96)	12.0 c (98)	3.0 c (100)	0.0 c (100)
Untreated	-	285.0 c	231.0 a (0)	240.0 a (0)	209.0 b (0)	322.0 a (0)	723.0 a (0)	849.0 a (0)

* Hexygon applied once On June 4, all other treatments applied twice on June 4 and 12. DAT refers to days after the first application of any product.

[x] Means followed by same letter do not differ significantly based on Kruskal-Wallis analysis of medians followed by pair-wise comparisons using the Mann-Whitney test (P=0.05).

During 2002 and 2003, Wise examined several miticides, including BioMite, Envidor, Fujimite, Mesa and Pyramite for efficacy on apple rust mite (*Aculus schlechtendali*) on apple. In 2002, Envidor, FujiMite and Mesa provided comparable control, while Pyramite looked ineffective (Table 16). In 2003, the PF + 10 d applications of Agri-Mek, Envidor and Mesa all had excellent activity on ARM, while Biomite was less effective (Table 17, Table 18). Among the threshold applications, Envidor, Pyramite and Zeal gave the best levels of control, while Acramite and Kanemite looked ineffective.

In 2003, Walgenbach examined several products, sprayed at petal fall on Jun 1, for efficacy on apple rust mite (*Aculus schlechtendali*) on apple. Agri-mek and Envidor were the most effective products (Table 19).

In 2004, Beers examined several products for efficacy on apple rust mite (*Aculus schlechtendali*) on apple. Acramite, Agri-mek and Envidor provided good to excellent control of a moderate infestation, while FujiMite, Zeal, and Pyramite were less effective (Table 20).

Table 16. * Efficacy on Apple Rust Mite (*Aculus schlechtendali*) on Apple (*Malus domestica*), 'Red Delicious' Wise, MI, 2002.

Treatment	Rate Per Acre	No. Motiles Per Leaf[x]	
		20 DAT	33 DAT
Envidor 240SC (spirodiclofen) + BioCover UL	7 fl oz + 1 gal	52.2 bc	37.9 b
Fujimite 5%EC (fenpyroximate)	32 fl oz	59.1 bc	52.8 b
Mesa .078EC (milbemectin) + BioCover UL	20 fl oz + 1 gal	35.6 c	46.5 b
Pyramite 60W (pyridaben)	6.6 oz	78.4 ab	75.2 ab
Untreated	-	99.8 a	74.0 ab

* Not an IR-4 Experiment: Arthropod Management Tests Vol 28: A19. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).

Table 17. * Efficacy on Apple Rust Mite (*Aculus schlechtendali*) on Apple (*Malus domestica*), 'Red Delicious' Wise, MI, 2003, Trial A

Treatment, Timing [y]	Rate Per Acre	No. Motiles Per Leaf [x]				
		Jun 23	Jul 3	Jul 8	Jul 29	Aug 12
Agri-Mek 0.15EC (abamectin) + Oil, A	10.0 fl oz	0.1 bc	0.3 c	0.7 c	9.5 c	8.3 b
Biomite (geraniol, citronellol, nerolidol, and farnesol), ABC	1.5 pt	1.2 ab	3.4 ab	8.4 b	63.4 b	-
	2.0 pt	1.8 a	5.5 a	7.4 b	56.0 ab	-
	3.0 pt	1.9 a	4.3 a	8.7 b	75.5ab	-
Envidor 240SC (spirodiclofen), A	8.75 fl oz	0.3 bc	0.5 bc	0.5 c	10.8 c	13.3 b
	11.0 fl oz	0.2 bc	0.4 c	0.6 c	15.1 c	9.8 b
Mesa .078EC (milbemectin) + Oil, A	20.0 fl oz	0.1 c	0.1 c	0.7 c	2.5 d	6.9 b
Untreated	-	3.4 a	10.9 a	53.9 a	102.3 a	84.1 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 29: A23. Not all treatments included in table.
[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).
[y] A = Jun 2 (PF + 10d), B = Jun 24 (European red mite threshold, 2-3 mpl), C = Jul 16.

Table 18. * Efficacy on Apple Rust Mite (*Aculus schlechtendali*) on Apple (*Malus domestica*), 'Red Delicious' Wise, MI, 2003, Trial B

Treatment, Timing [y]	Rate Per Acre	No. Motiles Per Leaf [x]	
		Jul 8	Jul 29
Acramite 50W (bifenazate) + Choice + Silwet	1.0 lb	180.0 a	174.4 bc
Envidor 240SC (spirodiclofen) + Induce	8.75 fl oz	37.3 b	56.5 d
Kanemite 15SC (acequinocyl)	31.0 fl oz	230.7 a	244.9 ab
Pyramite 70WP (pyridaben)	4.4 oz	47.7 b	123.5 c
Zeal 72WDG (etoxazole)	2.0 oz	36.1 b	119.8 c
Untreated	-	218.2 a	227.4 ab

* Not an IR-4 Experiment: Arthropod Management Tests Vol 29: A23. Not all treatments included in table.
[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).
[y] B = Jun 24 (European red mite threshold, 2-3 mpl).

Table 19. * Efficacy on Apple Rust Mite (*Aculus schlechtendali*) on Apple (*Malus domestica*), 'Delicious' Walgenbach, NC, 2003.

Treatment	Rate Per Acre	No. Per Leaf [x]				
		Jun 13	Jul 3	Jul 18	Aug 1	CMD [y]
Agri-Mek (abamectin) + Oil	10 fl oz + 0.25%	1.1 a	3.8 a	7.5 ab	15.2 a	254.3
Envidor 240SC (spirodiclofen)	14 fl oz	0.7 a	4.5 a	11.7 abc	22.5 a	366.8
	18 fl oz	1.0 a	2.7 a	4.2 a	9.9 a	325.9
Untreated	-	7.9 a	29.1 bc	44.2 d	39.1 a	1547.9 cd

* Not an IR-4 Experiment: Arthropod Management Tests Vol 29: A14. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).
[y] Cumulative mite days.

Table 20. * Efficacy on Apple Rust Mite (*Aculus schlechtendali*) on Apple (*Malus domestica*), 'Fuji' Beers, WA, 2004.

Treatment	Rate Per Acre	No. Per Leaf [x]			
		Aug 10	Aug 19	Aug 26	Sep 2
Acramite 50W (bifenazate) + Silwet	0.75 lb + 0.02% v/v	99.2 a	16.4 b	3.7 bcd	0.00 b
	1.0 lb + 0.02% v/v	29.9 a	4.9 b	1.7 cd	0.00 b
Acramite 75W (bifenazate) + Silwet	0.5 lb + 0.02% v/v	97.4 a	13.4 b	0.7 d	0.00 b
	0.67 lb + 0.02% v/v	76.4 a	15.8 b	1.6 cd	0.00 b
Agri-Mek 0.15EC (abamectin) + Saf-T-Side oil	16.0 fl oz + 0.25% v/v	66.6 a	13.3 b	4.8 bcd	0.00 b
Envidor 240SC Envidor 240SC (spirodiclofen)	14.0 fl oz	42.1 a	34.9 ab	1.5 cd	0.00 b
	18.0 fl oz	74.2 a	6.8 b	2.7 bcd	0.00 b
Envidor 240SC (spirodiclofen) + Saf-T-Side oil	18.0 fl oz + 0.02% v/v	70.4 a	12.0 b	2.0 cd	0.00 b
FujiMite 5%EC (fenpyroximate)	1.0 qt	61.2 a	26.4 ab	7.1 bc	0.06 b
Pyramite 60WP (pyridaben)	6.6 oz	75.6 a	31.4ab	8.8 b	0.39 ab
Zeal 72WDG (etoxazole)	2.0 oz	101.8 a	26.6 ab	8.7 b	1.36 a
Untreated	---	71.2 a	61.5 a	36.1 a	0.29 ab

* Not an IR-4 Experiment: Arthropod Management Tests Vol 30: A1.
[x] Means followed by same letter do not differ significantly based on Waller-Duncan *k*-ratio *t*-test, *k*-ratio=100.
[y] Data transformed log (x+0.5) due to unequal variances.
Treatments sprayed on Aug 13.

In 2004 and 2006, Riedl conducted two experiments to examine efficacy of Agri-Mek, Envidor, Mesa and Nexter on pear rust mites (*Epitrimerus pyri*) on pear. In 2004, all treatments provided immediate knockdown of mite populations (Table 21). The standard Agri-Mek provided control for up to 55 days after treatment. The low rate of Mesa provided control for approximately 27 days, the higher rate up to 36 days. In 2006, all treatments initially controlled populations of PRM (Table 22). The petal fall applications (Agri-Mek, Envidor and Envidor plus oil) provided control for up to 12 wk after treatment. Control with pink treatments did not last as long. The standard Nexter lasted for 7 wk, Envidor for 10 wk, and Envidor plus oil for 12 wk after treatment.

Table 21. * Efficacy on Pear Rust Mite (*Epitrimerus pyri*) on Pear (*Pyrus communis*), 'd'Anjou', Riedl, OR, 2004.

Treatment	Rate Per Acre	Number of Mites Per Leaf[x] (Henderson's % Control)							
		-1 DAT	7 DAT	13 DAT	20 DAT	27 DAT	36 DAT	55 DAT	63 DAT
Agri-Mek (abamectin) + Oil	10 fl oz + 1 gal	60.8 a	6.0 b (97)	4.3 b (97)	4.0 b (98)	3.3 b (99)	3.1 b (99)	21.4 b (84)	11.6 a (70)
Mesa .078EC (milbemectin) + Oil	25 fl oz + 1 gal	136.6 a	8.5 b (98)	4.0b (99)	8.2 b (98)	29.5 b (96)	109.0 ab (82)	246.6 a (17)	58.0 a (33)
Mesa .078EC (milbemectin) + Oil	30 fl oz + 1 gal	98.8 a	9.0 b (97)	4.7 b (98)	5.0 b (98)	20.3 b (96)	43.6 b (90)	152.9 ab (29)	43.1 a (31)
Untreated	-	37.7 b	135.0 a (0)	90.4 a (0)	127.0 a (0)	204.4 a (0)	169.3 a (0)	82.4 b (0)	23.8 a (0)

* Not an IR-4 Experiment: Arthropod Management Tests Vol 30: A37. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on Fisher's Protected LSD (P=0.05).

Table 22. * Efficacy on Pear Rust Mite (*Epitrimerus pyri*) on Pear (*Pyrus communis*), 'd'Anjou', Riedl, OR, 2006.

Treatment	**Rate Per Acre**	**Applic Timing**	**Number Per Leaf [x]**												
			May 12	**May 25**	**May 31**	**Jun 5**	**Jun 13**	**Jun 20**	**Jun 28**	**Jul 5**	**Jul 13**	**Jul 18**	**Jul 26**	**Aug 3**	**Aug 9**
Envidor 2SC (spirodiclofen)	18 fl oz	Pink (4/11)	1.1 b	1.7 b	0.9 b	1.2 ab	0.0 b	0.1 a	4.2 ab	15.9 a	52.3 a	34.6 ab	46.9 ab	33.3 b	7.7 a
Envidor 2SC + Omni Supreme Spray	18 fl oz + 0.25 %	Pink (4/11)	0.3 b	0.0 b	0.1 b	0.1 b	0.1 b	0.2 a	2.3 ab	2.2 b	8.3 b	13.1 bc	13.2 abc	20.0 bc	30. 2a
Nexter 75WP (pyridaben)	7 oz	Pink (4/11)	1.3 b	2.4 b	0.9 b	2.7 a	1.2 ab	0.4 a	6.8 ab	17.4 a	58.4 a	42.8 a	21.7 abc	20.1 bc	17.7 a
Agri-Mek 0.15EC (abamectin) + Omni Supreme Spray	10 fl oz + 0.25%	petal fall (5/3)	0.8 b	0.9 b	0.2 b	0.7 ab	0.0 b	0.0 a	0.4 b	0.3 b	1.8 b	1.4 c	2.2 bc	6.5 c	8.5 a
Envidor 2SC	18 fl oz	petal fall (5/1)	0.0 b	0.0 b	0.0 b	0.1 b	0.0 b	0.1 a	0.2 b	0.4 b	1.1 b	2.2 c	0.7 c	5.6 c	41.0 a
Envidor 2SC + Omni Supreme Spray	18 fl oz + 0.25%	petal fall (5/3)	1.0 b	0.7 b	0.0 b	0.7 ab	0.0 b	0.0 a	0.4 b	1.4 b	3.0 b	3.0 c	0.6 c	10.5 c	44.3 a
Untreated	-	-	13.6 a	13.6 a	8.4 a	3.4 a	2.7 a	1.4 a	1.5 a	8.3 a	9.3 ab	34.0 ab	44.5 a	51.0 a	62.7 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 32: A36.
[x] Means followed by same letter do not differ significantly based on Fisher's Protected LSD (P=0.05).

In 2004 and 2005, Schuster examined several products including Agri-Mek, Fujimite, Kanemite, Mesa and Oberon for efficacy on tomato russet mite (*Aculops lycopersici*) on tomato. In both years, the population was heavy at the time of spraying, but declined during the 2 wk after spraying (Table 23, Table 24). All treatments significantly reduced number of mites at 3 and 7 days after spraying.

Table 23. * Efficacy on Tomato Russet Mite (*Aculops lycopersici*) on Tomato (*Lycopersicon esculentum*), 'Sebring', Schuster, FL, 2004.

Treatment	Rate Per Acre	Number of Mites Per 10 Leaflets[x] (Henderson's % Control)				
		-1 DAT	4 DAT	7 DAT	14 DAT	21 DAT
Agri-Mek 0.15EC (abamectin)	12 fl oz	375 ab	107 b (79)	33 a (87)	21 ab (88)	9 b (0)
Fujimite 5%EC (fenpyroximate)	45.8 fl oz	484 ab	91 b (86)	48 a (76)	56 ab (74)	20 ab (0)
Kanemite 15SC (acequinocyl)	46.5 fl oz	367 ab	94 b (82)	78 a (89)	96 ab (42)	4 b
Mesa 1% EC (milbemectin)	24 fl oz	351 ab	114 b (77)	42 a (83)	13 b (92)	9 b (0)
Mesa 1% EC (milbemectin)	36 fl oz	426 ab	46 b (92)	48 a (84)	40 ab (79)	12 b (0)
Oberon 240SC (spiromesifen) + Induce	12.8 fl oz + 0.05% v/v	408 a	53 b (91)	17 a (94)	23 ab (87)	33 a (0)
Untreated	-	223 b	309 a (0)	153 a (0)	100 a (0)	4 b (0)

* Not an IR-4 Experiment: Arthropod Management Tests Vol 30: E82. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly (P=0.05, LSD).

Table 24. * Efficacy on Tomato Russet Mite (*Aculops lycopersici*) on Tomato (*Lycopersicon esculentum*), 'Sun Leaper', Schuster, FL, 2005.

Treatment	Rate Per Acre	Number of Mites Per 10 Leaflets			
		0 DAT	3 DAT	7 DAT	14 DAT
Agri-Mek 0.15EC (abamectin)	8 fl oz	99 a	9 b (68)	10 b (0)	4 a (0)
Fujimite 5%EC (fenpyroximate)	30.5 fl oz	134 a	19 b (50)	11 b (34)	5 a (0)
Kanemite 15SC (acequinocyl)	31 fl oz	223 a	27 b (57)	12 b (50)	2 a (0)
Mesa 1% EC (milbemectin)	16 fl oz	190 a	19 b (64)	12 b (42)	1 a (0)
Mesa 1% EC (milbemectin)	24 fl oz	103 a	22 b (34)	6 b (46)	3 a (0)
Oberon 240SC (spiromesifen) + Induce	8.5 fl oz + 0.05% v/v	193 a	5 b (91)	7 b (67)	2 a (0)
Untreated	-	203 a	57 a (0)	22 a (0)	1 a (0)

* Not an IR-4 Experiment: Arthropod Management Tests Vol 31: E76. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly (P=0.05, LSD).

Comparative Efficacy on Spider Mites

Spider mites (family *Tetranychidae*), including twospotted spider mite (*Tetranychus urticae*), European red mite (*Panonychus ulmi*), citrus red mite (*Panonychus citri*), are perhaps the most important mite pests of ornamentals. These are medium-sized mites that feed on a wide variety of host plants including ornamental trees, shrubs and bedding plants. All of these spider mites feed on plant leaves by piercing leaf tissues and sucking the green liquid that oozes out. Leaves appear bronzed after the green color is lost from many tiny feeding spots. Heavily infested leaves and branches can become covered with an almost invisible webbing.

Twospotted Spider Mite

In 2001, Cloyd conducted a greenhouse experiment to examine efficacy of Akari, Pylon, Floramite and Sanmite applied foliar for conrol of twospotted spider mites (*Tetranychus urticae*) on marigold (Table 25). All the treatments were significantly different from the untreated check, with Pylon providing the highest mortality. Akari was slightly inferior to the other products. No phytotoxicity was observed in any treatment.

Table 25. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Marigold (*Tagetes patula*) 'Antique Mix', Cloyd, IL, 2001.

Treatment	Rate Per 100 Gal	Percent Mortality[x]				
		0 DAT	7 DAT*	14 DAT	21 DAT	28 DAT
Pylon SC (chlorfenaphyr)	4.0 fl oz	0.8 a	98.6 a	98.6 a	89.6 a	91.3 a
Floramite 50SC (bifenazate)	4.0 fl oz	1.8 a	74.1 b	97.3 a	89.5 a	93.6 a
Sanmite 75WP (pyridaben)	4.0 oz	1.3 a	80.8 b	91.0 a	95.3 a	88.3 ab
Akari 5SC (fenpyroximate)	24.0 fl oz	2.1 a	75.3 b	69.0 b	71.5 b	84.1 b
Untreated	-	1.3 a	2.3 c	0.1 c	3.5 c	8.8 c

* Not an IR-4 Experiment: Arthropod Management Tests Vol 28: G26.

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

In 2005 mealybug trial conducted by Davis, a heavy population of twospotted spider mites (*Tetranychus urticae*) was present and efficacy of products in the trial was recorded (Table 26). Because of increasing mite population, Floramite, a registered miticide, was sprayed over the whole trial on 18 DAT. Safari applied foliar at 2 and 4 oz per 100 gal appeared to provide some control at 7 DAT.

Table 26. Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Marigold (*Tagetes patula*) 'Queen Sophia', Davis, MI, 2005

Treatment	Rate per 100 Gal	Number of Mites Per 3 Leaves		
		Pretreat 9/22	7 DAT 10/7	17 DAT 10/17
Aria 50SG (flonicamid)	60 g	6.50	16.00	67.00
Aria 50SG	120 g	0.50	26.67	97.33
Flagship 25WP (thiamethoxam)	2 oz	0.00	8.20	36.16
Flagship 25WP	4 oz	0.17	2.50	6.33
Orthene 97 (acephate)	1 lb	0.16	1.00	10.50
Safari 20SG (dinotefuran)	4 oz	0.16	0.33	9.00
Safari 20SG	8 oz	0.83	1.33	14.50
Safari 20SG - Drench	12 oz	0.7	11.00	78.67
Safari 20SG - Drench	24 oz	4.3	4.33	7.67
Talus 40SC (buprofezin)	18 fl oz	0.00	10.00	40.17
TriStar 30SG (acetamiprid)	112 g	0.00	1.83	14.50
TriStar 30SG	224 g	4.33	9.33	30.00
Untreated		4.0	10.83	37.33

*B-1956 surfactant mixed with Flagship, Safari, TriStar and Orthene foliar applications. Treatments applied on 9/30, foliar treatments reapplied on 10/14.

In 2008, Davis examined several products including BYI 08330, Meridian, Safari and Tristar for efficacy applied drench or foliar for efficacy on whiteflies, thrips and twospotted spider mites (*Tetranychus urticae*) on marigold (Table 27). BYI08330 was the only treatment that reduced mites significantly.

Table 27. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Marigold (*Tagetes patula*) 'Yellow Boy', Davis, MI, 2008.

Treatment	Rate Per 100 Gal	Applic. Method	Applic. Dates	Mite Population Rating[x, y]		
				10/14	10/21	11/4
BYI 08330 SC (spirotetramat)	0.38 fl oz	Drench	9/23	0.0 a	0.0 a	1.0 abc
BYI 08330 SC	0.64 fl oz	Drench	9/23	0.5 ab	0.0 a	0.5 a
BYI 08330 SC	0.96 fl oz	Drench	9/23	0.0 a	0.2 ab	0.5 a
BYI 08330 SC	1.28 fl oz	Drench	9/23	0.0 a	0.0 a	0.5 a
BYI 08330 SC	1.7 fl oz	Foliar	9/23, 10/7	0.3 ab	0.2 ab	0.3 a
BYI 08330 SC	2.5 fl oz	Foliar	9/23, 10/7	0.0 a	0.0 a	0.7 ab
Meridian 25WG (thiamethoxam)	1 oz	Foliar	9/23, 10/7	1.2 bc	0.7 abc	1.8 cd
Meridian 25WG (thiamethoxam)	2 oz	Foliar	9/23, 10/7	0.5 ab	0.8 bc	2.2 cd
Safari 20SG (dinotefuran)	2.84 oz	Drench	9/23	0.8 abc	0.7 abc	2.0 cd
TriStar 70WSP (acetamiprid)	2.3 oz	Foliar	9/23, 10/7	1.0 bc	0.5 ab	2.2 cd
Untreated	-	-	-	2.0 c	1.7 c	2.5 d

* Not an IR-4 Experiment: Arthropod Management Tests Vol 34: G35. Not all products tested included in table.

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

[y] Rating over a 5-leaf sample of 0-3 where 0 = no mites. A rating of 1 indicated that mites were present in one medium to large group on one leaflet or two small groups on different leaflets within the five leaf sample (1 - 15 individuals). A rating of 2 indicated two or three larger groups or three to five smaller groups of mites (16 – 35 individuals). A rating of 3 was indicative of many mites in numerous groups (36+ individuals).

In 2010, Ludwig conducted 2 greenhouse experiments to examine several products for efficacy on twospotted spider mites (*Tetranychus urticae*) on marigold. The products tested included Avid, Magus, Pylon, Suffoil-X and Ultra-Pure Spray Oil. In the first trial both Pylon and Ultra-Pure Spray Oil products provided excellent control of high populations (Table 28). This trial shows the importance of multiple miticide applications to properly control spider mites. While Pylon is effective miticide, there is an added benefit to using Ultra-Spray Oil as a tank mix or rotation partner. Similarly in the the second experiment, all treatments provided excellent control of high populations, with Magus residual activity at least 7 days longer than Avid. (Table 29).

Table 28. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Marigold (*Tagetes patula*) 'Dwarf Bolero', Ludwig, TX, 2010a.

Treatment	Rate Per 100 Gal	Applic Timing	Number Per 5 Leaves [x]				
			Sep 24	Oct 1	Oct 8	Oct 15	Oct 22
Nymphs + Adults							
Pylon (chlorfenaphyr)	5.2 fl oz	Weekly [y]	257.4 a	65.0 ab	49.4 b	8.0 b	14.6 b
Ultra-Pure Spray Oil (mineral oil)	200 fl oz	Weekly [y]	133.8 a	22.6 bc	0.2 d	0.4 b	5.6 b
Ultra-Pure Spray Oil	100 fl oz	Weekly [y]	135.0 a	8.8 c	0.0 d	0.4 b	0.2 b
+ Pylon	2.6 fl oz						
Ultra-Pure Spray Oil /	100 fl oz	Sep 24	247.6 a	11.8 c	9.2 c	4.6 b	12.0 b
Pylon /	5.2 fl oz	Oct 1					
Ultra-Pure Spray Oil	100 fl oz	Oct 8					
Untreated	-	-	209.0 a	367.2 a	663.4 a	2679.6 a	1049.8 a
Eggs							
Pylon (chlorfenaphyr)	5.2 fl oz	Weekly [y]	211.6 a	49.2 b	34.2 b	1.4 b	14.0 b
Ultra-Pure Spray Oil (mineral oil)	200 fl oz	Weekly [y]	181.8 a	15.8 b	6.0 c	0.4 b	8.4 b
Ultra-Pure Spray Oil	100 fl oz	Weekly [y]	88.4 a	12.8 c	0.0 c	0.0 b	0.0 b
+ Pylon	2.6 fl oz						
Ultra-Pure Spray Oil /	100 fl oz	Sep 24	318.8 a	0.4 c	4.4 c	0.0 b	10.8b
Pylon /	5.2 fl oz	Oct 1					
Ultra-Pure Spray Oil	100 fl oz	Oct 8					
Untreated	-	-	228.4 a	538.8 a	920.0 a	2360.8 a	892.6 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 36: G15.
[x] Means followed by same letter do not differ significantly based on Tukey's HSD test ($P = 0.05$).
[y] Treatments sprayed on Sep 24, Oct 1, and Oct 8.

Table 29. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Marigold (*Tagetes patula*) 'Dwarf Bolero', Ludwig, TX, 2010b.

Treatment	Rate Per 100 Gal	Number Per 5 Leaves [x]				
		Aug 29	Sep 5	Sep 13	Sep 19	Sep 24
Avid 0.15 EC (abamectin)	4 fl oz	53.0 a	0.8 b	4.0 b	5.8 b	92.6 ab
Magus SC (fenazaquin)	12 fl oz	71.6 a	0.0 b	0.0 c	0.0 b	1.2 c
	16 fl oz	56.4 a	0.0 b	0.0 c	0.0 b	5.8 c
	20 fl oz	61.8 a	0.0 b	0.6 bc	0.0 b	2.4 c
SuffOil-X (mineral oil)	1 gal	25.2 a	0.6 b	0 c	2.2 b	18.6 c
	2 gal	51.8 a	0.4 b	4.25 bc	5.8 b	19.8 b
Untreated	-	43.0 a	46.0 a	120.5 a	238.4 a	770.6 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 36: G16.
[x] Means followed by same letter do not differ significantly based on Tukey's HSD test ($P = 0.05$).
Treatments sprayed on Aug 29.

In 2011 and 2012, Price conducted greenhouse experiments to examine several products for efficacy on twospotted spider mites (*Tetranychus urticae*) on marigold. The products tested included Avid, Hexygon, M-Pede, Magus and Pylon. In 2011, Avid was the most effective treatment for a high infestation,

followed by Magus; Hexygon and M-Pede looked ineffective (Table 30). In the first 2012, trial, Avid, Pylon and Ultiflora provided excellent control of a high infestation, with M-Pede and Hexygon providing good to excellent control (Table 31). In the second 2012 experiment, all products (Avid, Magus and Pylon) provided excellent control of a high infestation (Table 32).

Table 30. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Marigold (*Tagetes patula*) 'Petite', Price, FL, 2011.

Treatment	Rate Per 100 Gal	Number Per 1.5 Leaves [x]					
		DAT 0	DAT 3	DAT 6	DAT 13	DAT 18	DAT 28
Motiles							
Avid 0.15 EC (abamectin)	4 fl. oz.	71.7 a	15.5 c-f	18.0 c	3.8 cd	3.5 de	34.0 fg
Hexygon 50DF (hexythiazox)	1 oz.	78.2 a	45.2 a	55.0 ab	126.5 a	293.8 a	208.2 a
	2 oz.	49.8 a	25.8 ab	52.7 ab	119.8 a	248.7 a	230.3 a
M-Pede 49% (potassium salts of fatty acids)	2 gal.	60.5 a	32.5 a-c	44.5 ab	72.3 a	398.3 a	123.7 a-c
Magus SC (fenazaquin)	12 fl. oz.	66.3 a	4.8 f-i	4.5 de	14.2 b	40.8 b	209.8 a
	16 fl. oz.	61.0 a	6.2 d-h	2.0 d-f	10.0 bc	20.5 b	124.0 a-d
Untreated	-	40.5 a	39.7 ab	72.2 a	94.3 a	404.7 a	172.8 ab
Eggs							
Avid 0.15 EC (abamectin)	4 fl. oz.	110.5a	58.3a	5.0h	11.2cd	6.3ef	98.3b-e
Hexygon 50DF (hexythiazox)	1 oz.	177.8a	89.3a	163.3a	438.3a	342.7a	55.2c-e
	2 oz.	112.8a	86.3a	96.3ab	295.2a	317.0a	73.0c-e
M-Pede 49% (potassium salts of fatty acids)	2 gal.	148.0a	53.5a	45.0c-e	415.2a	339.3a	38.7e
Magus SC (fenazaquin)	12 fl. oz.	176.3a	54.7a	47.5b-d	22.8b	77.2c	273.7a
	16 fl. oz.	136.8a	41.3a	35.5d-g	22.2b	75.5bc	211.7ab
Untreated	-	91.5a	66.8a	76.7a-c	318.3a	334.8a	63.7de

* Not an IR-4 Experiment: Arthropod Management Tests Vol 37: G21.

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

Table 31. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Marigold (*Tagetes patula*) 'Petite', Price, FL, 2012a.

Treatment	Rate Per 100 Gal	Number Motiles Per 3 Leaves [x]								
		DAT 0	DAT 1	DAT 3	DAT 8	DAT 14	DAT 21	DAT 28	DAT 35	DAT 42
Avid 0.15 EC (abamectin)	4 fl oz	28.5 a	7.2 a-c	4.2 cd	0.0 d	0.0 d	0.0 c	15.0 bc	35.5 cd	18.0 c
Hexygon 50DF (hexythiazox)	2 oz	51.3 a	27.8 a	30.7 b	9.0 b	9.5 b	3.5 bc	12.3 b	37.5 bc	45.0 bc
M-Pede 49% (potassium salts of fatty acids)	256 fl oz	34.2 a	14.2 ab	10.5 bc	3.3 c	2.0 bc	3.7 b	11.3 b	59.3 b	157.7 a
Pylon (chlorfenaphyr)	5.2 fl oz	17.3 a	8.2 bc	3.8 cd	0.3 d	0.0 d	0.2 bc	2.0 c-e	8.7 cd	39.3 b
Ultiflora (milbemectin)	12 fl oz	63.3 a	9.8 c	4.3 bc	0.0 d	0.0 d	0.0 c	0.0 e	5.8 cd	46.7 bc
Untreated	-	43.8 a	43.0 a	111.8 a	72.7 a	84.0 a	57.3 a	145.5 a	300.0 a	237.3 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 38: G12. Not all treatments included in table.
[x] Means followed by same letter do not differ significantly based on Fisher's Protected LSD (P=0.05).
Treatments sprayed on Apr 3.

Table 32. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Marigold (*Tagetes patula*) 'Petite', Price, FL, 2012b.

Treatment	Rate Per 100 Gal	Number Per 3 Leaves [x]							
		DAT 0	DAT 1	DAT 3	DAT 7	DAT 15	DAT 21	DAT 28	DAT 35
Motiles									
Avid 0.15 EC (abamectin)	4 fl oz	47.8 a	6.0 bc	4.5 b	2.2 bc	0.0 b	0.0 b	3.3 b	14.2 b
Magus SC (fenazaquin)	18 fl oz	24.7 a	15.3 b	0.2 d	0.0 c	0.5 b	0.0 b	0.5 b	12.3 b
Pylon (chlorfenaphyr)	5.2 fl oz	56.3 a	17.2 b	2.0 bc	4.3 b	0.3 b	0.5 b	3.3 b	15.7 b
Untreated	-	28.2 a	71.5 a	143.7 a	102.3 a	233.3 a	143.2 a	99.2 a	358.8 a
Eggs									
Avid 0.15 EC (abamectin)	4 fl oz	172.7 a	65.7 ab	21.2 b	3.2 b	0.0 b	0.0 c	17.3 b	39.8 b
Magus SC (fenazaquin)	18 fl oz	175.8 a	121.0 ab	9.0 b	7.0 b	7.7 b	0.0 c	11.2 b	32.2 b
Pylon (chlorfenaphyr)	5.2 fl oz	174.2 a	106.3 ab	24.8 b	5.0 b	0.5 b	11.2 bc	21.2 b	78.3 b
Untreated	-	173.7 a	249.2 a	221.0 a	237.8 a	525.8 a	311.2 a	287.2 a	477.5 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 38: G14. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on Fisher's Protected LSD (P=0.05).
Treatments sprayed on Mar 27.

In 2012, Schultz examined Avid, BAS 92102 and Floramite for efficacy on twospotted spider mites (*Tetranychus urticae*) on greenhouse marigold. All treatments provided excellent control of a moderate to high infestation (In 2008, Canas examined Pylon and Ultiflora for efficacy on twospotted spider mites (*Tetranychus urticae*) on greenhouse New Guinea impatiens. Both products provided excellent control of high nymphs and adult populations (Table 34).

In 2006, 2010, 2011 and 2016, Wise examined several miticides, including Acramite, Actara, Envidor and Proclaim and Zeal for control of twospotted spider mites (*Tetranychus urticae*) on tart cherry. In 2006, all treatments reduced mite infestation, with Acramite and Envidor maintaining populations below economic thresholds for the entire evaluation period; Proclaim provided inferior performance (Table 35). In 2010, Envidor and Zeal were the most effective treatments, followed by Endigo; Acramite looked ineffective (Table 36). In 2011, all treatments provided effective control (Table 37). In 2016, both treatments (Magister and Nealta) provided effective control (Table 38).

Table 33).

In 2008, Canas examined Pylon and Ultiflora for efficacy on twospotted spider mites (*Tetranychus urticae*) on greenhouse New Guinea impatiens. Both products provided excellent control of high nymphs and adult populations (Table 34).

In 2006, 2010, 2011 and 2016, Wise examined several miticides, including Acramite, Actara, Envidor and Proclaim and Zeal for control of twospotted spider mites (*Tetranychus urticae*) on tart cherry. In 2006, all treatments reduced mite infestation, with Acramite and Envidor maintaining populations below economic thresholds for the entire evaluation period; Proclaim provided inferior performance (Table 35). In 2010, Envidor and Zeal were the most effective treatments, followed by Endigo; Acramite looked ineffective (Table 36). In 2011, all treatments provided effective control (Table 37). In 2016, both treatments (Magister and Nealta) provided effective control (Table 38).

Table 33. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Marigold (*Tagetes patula*), Schultz, VA, 2012.

Treatment	Rate Per 100 Gal	Number Per Compound Leaf [x]					
		Pre		DAT 4		DAT 7	
		Adults	Eggs	Adults	Eggs	Adults	Eggs
Avid 0.15 EC (abamectin)	4 fl. oz	46.3 a	92.0 a	0.0 b	0.5 a	0.0	0.0
BAS 92102	13.7 fl. oz	90.3 a	394.3 a	0.0 b	6.5 a	0.0	0.0
Floramite SC (bifenazate)	4 fl. oz	33.0 a	97.8 a	0.0 b	1.0 a	0.0	0.0
Untreated		87.8 a	76.0 a	100.5 a	15.5 a	65.0	46.3

* Not an IR-4 Experiment: Arthropod Management Tests Vol 39: G8.
[x] Means followed by same letter do not differ significantly based on Fisher's LSD (P=0.05).

Table 34. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on New Guinea Impatiens (*Impatiens hawkeri*) 'Sonics Hot Rose', Canas, OH, 2007.

Treatment	Rate Per 100 Gal	Number Per 3 Leaves [x]						
		DAT 0	DAT 4	DAT 7	DAT 14	DAT 21	DAT 28	DAT 35
Nymphs								
Pylon (chlorfenaphyr)	2.6 fl oz	64.7 a	29.3 b	9.6 c	0.0 d	0.3 c	1.0 c	15.3 c

Ultiflora (milbemectin)	16 fl oz	37.9 a	86.0 b	80.4 b	13.4 b	5.3 b	4.7 b	73.1 b
Ultiflora + Induce	12 fl oz	65.3 a	108.7 ab	98.6 b	7.7 c	1.0 c	0.6 c	11.4 c
Untreated	-	43.3 a	292.3 a	393.0 a	254.7 a	539.7 a	711.3 a	1384.0 a
Adults								
Pylon (chlorfenaphyr)	2.6 fl oz	12.9 a	0.0 c	0.0 b	0.0 b	0.0 b	0.4 b	50.4 b
Ultiflora (milbemectin)	16 fl oz	9.0 a	1.0 b	0.1 b	0.1 b	0.3 b	1.0 b	34.0 b
Ultiflora + Induce	12 fl oz	10.7 a	2.0 b	0.6 b	0.3 b	0.0 b	0.1 b	17.4 b
Untreated	-	9.4 a	6.9 a	8.3 a	28.7 a	20.0 a	187.3 a	592.0 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 34: G34.

[x] Means followed by same letter do not differ significantly based on Duncan-Waller's mean separation test (P = 0.05).

Table 35. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Tart Cherry (*Prunus cerasus*), 'Montmorency' Wise, MI, 2006.

Treatment	Rate Per Acre	Number of Motiles Per Leaf[x] (Henderson's % Control)					
		Precount	7 DAT	13 DAT	20 DAT	27 DAT	34 DAT
Acramite 50WS (bifenazate) + Choice	16 oz + 3 qt/100 gal	216.71 a	12.07 d (92)	0.91 d (99)	2.72 d (95)	2.84 c (93)	1.28 d (96)
Envidor (spirodiclofen)	16 fl oz	226.27 a	20.52 d (92)	2.51 d (98)	4.04 d (98)	2.35 c (97)	2.72 d (92)
Envidor + Sylgard	16 + 4 fl oz	205.26 a	35.06 cd (77)	7.70 d (92)	7.54 cd (90)	4.00 c (94)	3.38 d (81)
Proclaim 5SG (emamectin benzoate)	8 oz	260.05 a	98.63 b (60)	58.63 bc (68)	46.72 b (71)	39.47 b (69)	27.11 b (45)
Untreated	-	218.36 a	229.40 a (0)	149.56 a (0)	201.22 a (0)	162.90 a (0)	58.17 a (0)

* Not an IR-4 Experiment: Arthropod Management Tests Vol 32: B3. Not all products tested included in table.

[x] Means followed by same letter do not differ significantly based on Duncan's New MRT (P=0.05).

Table 36. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Tart Cherry (*Prunus cerasus*), 'Montmorency' Wise, MI, 2010.

Treatment	Rate Per Acre	Number of Motiles Per Leaf [x]				
		Pre	7 DAT	13 DAT	20 DAT	27 DAT
Actara 25 WDG (thiamethoxam)	5.5 oz	25.5 a	25.9 a	17.8 a	15.4 bc	1.3 bc
Endigo 2.06 ZC (lambda-cyhalothrin + thiamethoxam)	6 fl oz	5.1 b	2.8 c	4.9 b	20.7 a	24.5 a
Envidor 240 SC (spirodiclofen)	18 fl oz	14.0 ab	1.8 c	2.2 bc	1.8 c	0.4 bc
Zeal 72 WDG (etoxazole)	2 oz	8.6 ab	3.5 c	1.7 bc	1.4 c	0.3 bc
Untreated	-	7.5 ab	9.2 b	17.1 a	6.3 bc	1.5 bc

* Not an IR-4 Experiment: Arthropod Management Tests Vol 36: B3. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on Duncan's New MRT (P=0.05).
Treatments sprayed on Aug 4.

Table 37. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Tart Cherry (*Prunus cerasus*), 'Montmorency' Wise, MI, 2011.

Treatment	Rate Per Acre	Number of Motiles Per Leaf [x]					
		Pre	7 DAT	14 DAT	21 DAT	28 DAT	35 DAT
Agri-Mek 0.15EC (abamectin) + Damoil	10 fl oz + 0.25% v/v	8.2 a	1.4 b	1.4 b	5.5 b	11.3 b	10.4 a
Endigo 2.06 ZC (lambda-cyhalothrin + thiamethoxam)	3 fl oz	9.0 a	2.8 b	4.9 b	11.8 b	21.4 b	106.1 a
	6 fl oz	2.7 a	2.7 b	7.1 b	15.1 b	31.7 b	49.5 a
Envidor 240 SC (spirodiclofen)	18 fl oz	8.3 a	2.5 b	1.8 b	3.1 b	5.1 b	3.3 a
Movento 240 SC + R-11	6 fl oz + 0.25 % v/v	-	3.0 b	2.3 b	1.0 b	1.4 b	8.2 a
Untreated	-	18.07 a	12.6 a	27.2 a	38.8 a	70.2 a	63.5 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 37: B5. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on Duncan's New MRT (P=0.05).
All treatments applied on Jul 29 (TSSM threshold), except Movento which was applied on Aug 1.

Table 38. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Tart Cherry (*Prunus cerasus*), 'Montmorency' Wise, MI, 2016.

Treatment	Rate Per Acre	Number of Motiles Per Leaf [x]					
		Jul 28	Aug 4	Aug 10	Aug 18	Aug 25	Aug 31
Magister 1.6 SC (fenazaquin)	24 fl oz	13.1a	4.4ab	2.6b	9.2ab	2.7b	5.8a
	32 fl oz	5.0a	5.5ab	1.9b	1.1c	1.6b	5.2a
Nealta 200 SC + Sylgard	13.7 fl oz	1.7a	1.5b	2.8b	5.3bc	4.0b	5.6a
Untreated	-	9.5a	15.3a	47.2a	34.7a	26.0a	17.7a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 43: Sec B. Not all products tested included in table.
[x] Means followed by same letter do not differ significantly based on Duncan's New MRT (P=0.05).
Treatments sprayed on Jul 29 (TSSM threshold).

In 2004 and 2008, Price examined several miticides, including Agri-Mek, Acramite, BYI 08330, Nealta and Suffoil-X for control of twospotted spider mites (*Tetranychus urticae*) on strawberry. In 2004, Nealta + Cohere surfactant provided excellent reduction of mite motiles and eggs, comparable to the standard Acramite, while Suffoil-X was less effective (Table 39). In 2008, all treatments provided excellent reduction of motiles and eggs (Table 40). No phytotoxicity was observed in any treatment.

Table 39. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Strawberry (*Fragariae ananassa*), 'Sweet Charlie' Price, FL, 2004.

Treatment	Rate Per Acre	Number Per Leaflet [x]				
		Apr 7	Apr 16	Apr 23	Apr 29	May 8
Motiles						
Acramite 50WS (bifenazate)	1 lb	4.0 a	16.0 a	10.0 bc	0.8 c	0.5 b
Nealta 200SC (cyflumetofen) + Cohere	13.7 fl oz + 0.125% v/v	3.8 a	14.7 a	2.8 c	1.2 c	0.3 b
SuffOil-X (mineral oil)	2 gal	1.7 a	1.7 a	21.8 ab	12.7 b	16.7 a
Untreated	-	5.8 a	13.8 a	25.0 a	61.5 a	26.2 a
Eggs						
Acramite 50WS	1 lb	4.8 a	47.2 a	15.8 b	0.3 c	0.3 b
Nealta 200SC + Cohere	13.7 fl oz + 0.125% v/v	3.5 a	51.5 a	12.0 b	0.2 c	0.7 b
SuffOil-X	2 gal	5.3 a	32.0 a	82.8 a	33.5 b	55.0 a
Nontreated	-	9.2 a	48.0 a	92.5 a	139.0 a	25.8 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 40: No 1.

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

Treatments sprayed on Apr 17 and 24.

Table 40. * Efficacy on Twospotted Spider Mite (*Tetranychus urticae*) on Strawberry (*Fragariae ananassa*), 'Sweet Charlie' Price, FL, 2008.

Treatment[y]	Rate Per Acre	Number of Mites Per Leaf[x] (Henderson's % Control)						
		1/15	1/22	1/29	2/6	2/12	2/19	2/26
Number of Motiles Per Plant								
Agri-Mek 0.15EC (abamectin)	16 fl oz	4.5 a	0.3 a (68)	2.0 a (0)	0.0 c (100)	0.3 c (96)	0.0 b (100)	0.8 b (99)
Acramite 50WS (bifenazate)	16 oz	14.3 a	1.3 a (56)	5.0 a (21)	1.0 c (96)	0.8 c (97)	0.3 b (95)	3.3 b (99)
BYI 08330 SC (spirotetramat) + NIS	5 fl oz	9.8 a	2.5 a (0)	0.5 a (89)	5.0 b (71)	5.8 b (65)	2.3 b (83)	2.3 b (99)
Untreated	-	6.3 a	1.3 a (0)	2.8 a (0)	11.0 a (0)	10.8 a (0)	8.5 a (0)	105.5 a (0)
Number of Eggs Per Leaflet								
Agri-Mek 0.15EC (abamectin)	16 fl oz	15.8 a	3.3 a (66)	2.3 b (89)	0.5 b (100)	0.5 b (99)	0.3 b (100)	0.0 b (100)
Acramite 50WS (bifenazate)	16 oz	21.3 a	15.5 a (0)	3.0 b (90)	6.5 b (96)	2.0 b (98)	2.0 b (98)	3.8 b (99)
BYI 08330 SC (spirotetramat) + NIS	5 fl oz	37.3 a	0.8 a (97)	0.0 b (100)	17.0 b (95)	26.0 a (83)	2.0 b (99)	5.3 b (100)
Untreated	-	7.8 a	4.8 a (0)	10.5 a (0)	65.5 a (0)	31.3 a (0)	32.8 a (0)	243.0 a (0)

* Not an IR-4 Experiment: Arthropod Management Tests Vol 34: C24. Not all products tested included in table.

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

[y] Acramite and BYI 08330 applied on 1/18 and 2/14, Agri-Mek applied on 1/18, 1/23, 2/14 and 2/21.

Southern Red Mite

In 2007, Gilrein examined several miticides, including Shuttle, Floramite, Ovation and Sanmite for control of Southern red mites (*Oligonychus ilicis*) on holly. All treatments provided excellent reduction of mites (Table 41). No phytotoxicity was observed in any treatment.

Table 41. * Efficacy on Southern Red Mite (*Oligonychus ilicis*) on Holly (*Ilex* x *meserveae*) 'Blue Princess', Gilrein, NY, 2007.

Treatment	Rate per 100 Gal	Number of Mites [x]		
		Pretreat 11/3	22 DAT 11/26	29 DAT 12/3
Floramite 2SC (bifenazate)	8 fl oz	48.9 a	0.0 b	0.3 b
Ovation SC (clofentezine)	8 fl oz	48.8 a	1.1 b	1.0 b
Sanmite 75WP (pyridaben)	4 oz	58.5 a	0.1 b	0.0 b
Shuttle 15SC (acequinocyl)	6.4 fl oz	65.1 a	0.1 b	0.1 b
Shuttle 15SC (acequinocyl)	12.8 fl oz	60.6 a	0.0 b	0.4 b
Untreated	-	53.9 a	107.5 a	113.1 a

[x] Means followed by same letter do not differ significantly (P=0.05, Fisher's LSD).

Citrus Red Mite

In 1999, Hara examined several miticides, including Conserve, Cinnamite Floramite and Avid, sprayed once for control of citrus red mite (*Panonychus citri*) on anthurium. Avid and Floramite gave good initial and residual control of CRM, while Cinnamite and Conserve were ineffective (Table 42).

Table 42. * Efficacy on Citrus Red Mite (*Panonychus citri*) onAnthurium (*Anthurium andraeanum*), 'Rainbow Obake', Hara, HI, 1999.

Treatment	Rate per 100 Gal	Number of Mites Per Leaf			
		7 DAT	14 DAT	21 DAT	28 DAT
Avid 0.15EC	4 fl oz	2.5 d	4.0 b	2.8 c	4.1 c
Cinnamite (cinnamaldehyde)	85 fl oz	10.2 bc	15.7 a	11.4 a	18.7 a
Conserve SC (spinosad)	20 fl oz	26.5 a	25.1 a	8.7 ab	13.1 ab
Floramite 2SC (bifenazate)	4 fl oz	4.4 cd	2.0 b	4.2 bc	5.4 bc
Untreated	-	22.8 ab	13.7 a	19.3 a	15.5 a

* Not an IR-4 Experiment: Arthropod Management Tests Vol 25: D2.
[x] Means followed by same letter do not differ significantly (P=0.05, Tukey's multiple comparison procedure). Treatments were applied once on Sep 22.

In 2007, Grafton-Cardwell examined several miticides, including Agri-Mek, Envidor, Kanemite and Movento for control of citrus red mite (*Panonychus citri*) on orange. All treatments significantly reduced citrus red mite densities for 8 weeks after treatment (Table 43). Movento and Envidor showed the greatest level of control of citrus red mite.

Table 43. * Efficacy on Citrus Red Mite (*Panonychus citri*) on Orange (*Citrus sinensis)*, 'Fukumoto' Grafton-Cardwell, CA, 2007.

Treatment[y]	Rate Per Acre	Number of Female Mites Per Leaf[x] (Henderson's % Control)								
		Pretreat	2 WAT	3 WAT	4 WAT	5 WAT	6 WAT	7 WAT	8 WAT	9 WAT
Agri-Mek 0.15EC (abamectin)	10 fl oz	4.18 a	0.34 b (86)	1.05 b (74)	0.73 bc (88)	0.58 bc (90)	0.63 c (83)	0.14 cd (90)	0.14 cd (90)	0.16 b (4)
Envidor 240SC (spirodiclofen) + Induce	20 fl oz	4.21 a	0.10 cd (96)	0.20 cd (95)	0.31 ef (95)	0.14 e (98)	0.18 e (95)	0.05 d (96)	0.05 d (96)	0.06 c (64)
Kanemite 15SC (acequinocyl)	31 fl oz	4.18 a	0.13 cd (95)	0.25 cd (94)	0.40 c-f (93)	0.27 de (96)	0.46 cd (88)	0.09 cd (93)	0.09 cd (93)	0.08 c (52)
Movento 240SCSC (spirotetramat) + Induce	10 fl oz	4.19 a	0.07 d (97)	0.25 cd (94)	0.35 def (94)	0.22 de (96)	0.30 de (92)	0.06 d (96)	0.06 d (96)	0.06 c (63)
Untreated	-	4.28 a	2.55 a (0)	4.18 a (0)	6.03 a (0)	6.17 a (0)	3.78 a (0)	1.40 a (0)	1.40 a (0)	0.17 ab (0)

* Not an IR-4 Experiment: Arthropod Management Tests Vol 33: D5. Not all products tested included in table.

[x] Means followed by same letter do not differ significantly based on LSD (P=0.05).

Comparative Efficacy on Red Palm Mite

The red palm mite (family *Tenuipalpidae*), is widespread in the tropical and subtropical regions throughout the Eastern Hemisphere. It was first reported in the Western Hemisphere in 2004 in the Caribbean island Martinique and in the U.S. in Palm Beach County on December 2007. Since then it has been reported in Broward, Miami-Dade, Monroe and other counties. It is a significant threat to all ornamental palms, coconut, and banana. The mite thrives on the underside of leaves and fronds and in high numbers, causes localized leaf yellowing followed by death of plant tissue.

In 2008, Pena conducted two experiments in Florida, and Rodriguez one trial in Puerto Rico, to examine efficacy of several products including Avid/Agrimek, Forbid/Judo, Hexygon, Ovation, Pylon, Sanmite, Shuttle, Sulfur/Thiolux, Tetrasan and Ultiflora on red palm mite (*Raoiella indica*) on coconut palm. In the first Florida trial, Avid and Tetrasan significantly reduced mite infestation, though less effective than Sulfur (Table 44). In the second trial, Agrimek treatments, Sanmite and Thiolux significantly reduced infestation up to 56 DAT; the other products had less residual activity (Table 45). Results of the Puerto Rico trial showed Forbid and Judo providing excellent control, while Hexygon, Ovation and Tetrasan were less effective, and Avid was ineffective (Table 46). No phytotoxicity was observed in any treatment.

Table 44. * Efficacy on red palm mite (*Raoiella indica*) on coconut palm (*Cocos* sp.), Pena, FL, 2008. Test 1.

Treatment	Rate Per 100 Gal	Number of Mites Per 20 Lens Fields[x] (Henderson's % Control)						
		0 DAT	8 DAT	14 DAT	21 DAT	28 DAT	33 DAT	42 DAT
Avid 0.15EC (abamectin)	4 fl oz	17.45 b	15.35 c (23)	20.20 bc (22)	69.35 a (0)	66.50 a (0)	115.00 ab (0)	46.65 ab (0)
Sulfur 6L (sulfur)	2.5 gal	17.6 b	1.65 c (92)	14.65 c (44)	21.40 c (16)	15.95 b (58)	25.95 c (0)	16.35 b (4)
Tetrasan 5WDG (etoxazole)	16 oz	14.7 b	10.35 c (38)	27.90 abc (0)	29.60 bc (0)	7.40 b (77)	40.90 c (0)	27.45 ab (0)
Untreated	-	34.85 a	39.70 ab (0)	51.60 a (0)	50.35 abc (0)	75.80 a (0)	51.40 c (0)	33.75 ab (0)

[x] Means followed by same letter do not differ significantly (P=0.05, LSD). Not all treatments included in table.

Table 45. * Efficacy on red palm mite (*Raoiella indica*) on coconut palm (*Cocos* sp.), Pena, FL, 2008. Test 2.

Treatment	Rate Per 100 Gal	Number of Mites Per 20 Lens Fields[x] (Henderson's % Control)						
		0 DAT	7 DAT	13 DAT	21 DAT	27 DAT	42 DAT	56 DAT
Agrimek0.15EC (abamectin)	8 fl oz	45.35 a	9.35 bc (78)	11.90 cd (83)	10.35 cd (62)	16.55 cd (64)	20.80 cd (72)	14.90 de (53)
Agrimek 0.15EC +Oil	8 fl oz + 1 %	91.65 a	6.50 bc (92)	9.45 cd (93)	5.50 cd (90)	7.05 d (92)	7.20 d (95)	10.35 e (84)
Agrimek 0.15EC +Silwet	8 fl oz +4 fl oz	70.95 a	4.35 c (93)	21.20 cd (81)	0.20 d (100)	0.10 d (100)	2.05 d (98)	0.05 e (100)
Pylon (chlorfenaphyr)	5.2 fl oz	122.8 a	10.00 bc (91)	40.40bc (79)	13.50 cd (82)	43.70 c (65)	74.75 abc (63)	74.75 abc (14)
Sanmite (pyridaben)	6 oz	49.95 a	5.75 bc (88)	0.90 d (99)	2.90 d (90)	4.15 d (92)	8.50 d (90)	26.45 cde (25)
Shuttle 15SC (acequinocyl)	12.8 fl oz	118.6 a	3.15 c (97)	12.80cd (93)	15.05 cd (79)	22.95 cd (45)	35.15 cd (82)	61.80 bcd (26)
Tetrasan 5WDG (etoxazole)	16 oz	35.30 a	16.15 bc (51)	25.75 cd (53)	32.10 bc (0)	28.05 cd (21)	76.70 bc (0)	65.35 bc (0)

Treatment	Rate Per 100 Gal	Number of Mites Per 20 Lens Fields[x] (Henderson's % Control)						
		0 DAT	7 DAT	13 DAT	21 DAT	27 DAT	42 DAT	56 DAT
Thiolux (sulfur)	10 lb	65.35 a	10.35 bc (83)	7.50 cd (93)	21.85 cd (44)	45.15 c (32)	27.30 cd (75)	36.60 cde (21)
Ultiflora (milbemectin)	16 fl oz	65.00 a	28.10 b (56)	74.65 b (36)	53.15 b (0)	78.50 b (0)	99.85 b (8)	123.55 a (0)
Untreated	-	143.3 a	134.00 a (0)	222.70 a (0)	85.20 a (0)	144.95 a (0)	238.50 a (0)	101.25 ab (0)

[x] Means followed by same letter do not differ significantly (P=0.05, LSD).
* All treatments applied 9/11; Agrimek treatments reapplied 14 days later.

Table 46. * Efficacy on red palm mite (*Raoiella indica*) on coconut palm (*Cocos* sp.), Rodriguez, PR, 2008.

Treatment	Rate Per 100 Gal	Number of Mites Per 20 Lens Fields[x] (% Control) at 14 DAT
Avid 0.15EC (abamectin)	4 fl oz	32.73 ab (41)
Forbid 480SC (spiromesifen)	2 fl oz	1.02 c (98)
Hexygon DF (hexythiazox)	2 oz	16.82 b (70)
Judo (spiromesifen)	2 fl oz	0.00 c (100)
Ovation SC(clofentezine)	2 fl oz	13.64 b (75)
Tetrasan 5 WDG (etoxazole)	10 oz	20.91 b (62)
Untreated	-	55.23 a (0)

[x] Means followed by same letter do not differ significantly (P=0.05, Tukey's HSD).

Efficacy Summary by Active Ingredient

Abamectin. Avid and Agri-Mek generally provided excellent efficacy on broad mite in a New Guinea impatiens and 8 pepper trials. Avid® + 1% SuffOil X provided good initial, but short residual, activity on the Eriophyid *Aceria* sp. in a New Mexico olive test. It provided excellent efficacy on hedge privet rust mites in a variegated privet trial. Excellent efficacy on apple rust mites and pear rust mites was obtained from Agri-Mek in 3 apple and 2 pear trials. Avid provided excellent efficacy on twospotted spider mites in 5 marigold trials, and single trials in tart cherry and strawberry. Mixed efficacy on red palm mite was obtained in three coconut palm trials. Agri-Mek significantly reduced tomato russet mite infestations in two tomato trials. Avid and Agri-Mek provided good efficacy on citrus red mite in single trials on anthurium and orange.

Acequinocyl. Shuttle provided excellent efficacy on Southern red mite in a holly trial, and good efficacy on red palm mite in a coconut palm trial, and on citrus red mite in an orange trial. Kanemite significantly reduced tomato russet mite infestations in two tomato trials, comparable to Agri-Mek, but poor control of apple rust mite was obtained in an apple trial.

Chlorfenapyr. Pylon alone or in tank-mix combination with Ultra-Pure Oil or Suffoil-X provided excellent efficacy on broad mite in a New Guinea impatiens trial. Also it provided excellent efficacy on hedge privet rust mite in a variegated privet trial, good efficacy on red palm mite in a coconut palm trial and good to excellent efficacy on twospotted spider mite in a New Guinea impatiens and 4 marigold trials.

Cyflumetofen. Nealta + Sylgard provided good to excellent efficacy on twospotted spider mite in single trials in tart cherry and strawberry.

Chromobacterium subtsugae NRRL B-30655. MBI 203 provided poor efficacy on broad mite in a New Guinea impatiens trial.

Clofentezine. Ovation provided excellent efficacy on Southern red mite in a holly trial, but mediocre efficacy on red palm mite in a coconut palm trial.

Emamectin Benzoate. Proclaim provided excellent efficacy on broad mite in a New Guinea impatiens trial but poor efficacy in a bell pepper trial. It generally provided efficacy on the Eriophyid *Aceria* sp. in a New Mexico olive test that was comparable to the standard Avid® + 1% SuffOil X. It provided excellent efficacy, though slower-acting, on hedge privet rust mites in a variegated privet trial. Efficacy on twospotted spider mite was mediocre in a tart cherry trial.

Etoxazole. Tetrasan provided poor to mediocre efficacy on red palm mite in three coconut palm trials. Zeal provided good control of apple rust mite in an apple trial.

Fenazaquin. Magus provided good efficacy on broad mite in a New Guinea impatiens trial, and excellent efficacy on twospotted spider mites in 3 marigold trials. It generally provided efficacy on the Eriophyid *Aceria* sp. in a New Mexico olive test that was comparable to the standard Avid® + 1% SuffOil X. It provided excellent efficacy on hedge privet rust mites in a variegated privet trial.

Fenpyroximate. Akari provided mediocre activity on the Eriophyid *Aceria* sp. in a New Mexico olive test. It provided excellent, though slow-acting, efficacy on hedge privet rust mites in a variegated privet trial, and good efficacy on twospotted spider mite in a marigold trial. Fujimite significantly reduced apple rust mite infestation in an apple trial and tomato russet mite infestations in two tomato trials. It provided good efficacy on broad mite in a bell pepper trial.

Hexythiazox. Hexygon was ineffective on the Eriophyid *Aceria* sp. in a New Mexico olive test and on hedge privet rust mites in a variegated privet trial. It provided good to excellent control of twospotted spider mites in 2 marigold trials, but mediocre efficacy on red palm mite in a coconut palm trial.

Metarhizium anisophliae. Tick Ex provided excellent, though slower-acting, efficacy on hedge privet rust mites in a variegated privet trial.

Milbemectin. Mesa provided excellent efficacy on broad mite in two bell pepper trials. Ultiflora provided excellent control of twospotted spider mite in a marigold and a New Guinea impatiens trial, but mediocre activity on the Eriophyid *Aceria* sp. in a New Mexico olive test, and poor efficacy on red palm mite in a coconut palm trial. It provided excellent efficacy on hedge privet rust mites in a variegated privet trial. Mesa provided good efficacy on apple rust mite infestation in 2 apple trials. It provided good efficacy on pear rust mites in a pear trial but it has less residual activity than Agri-Mek. It significantly reduced tomato russet mite infestations in two tomato trials, comparable to Agri-Mek.

Petroleum Oil. SuffOil X provided good efficacy on broad mite in a New Guinea impatiens trial, and excellent efficacy on twospotted spider mite was obtained in 2 marigold trials.

Pyridaben. Sanmite provided excellent efficacy on Southern red mite in a holly trial, and good efficacy on on red palm mite in a coconut palm trial, and on twospotted spider mite in a marigold trial. Efficacy on apple rust mite was poor to mediocre in 2 apple trial.

Spiromesifen. Forbid and Judo provided excellent efficacy on red palm mite in a coconut palm trial. Oberon provided excellent efficacy on broad mite in a bell pepper trial. It significantly reduced tomato russet mite infestations in two tomato trials, comparable to Agri-Mek.

Spirotetramat. Kontos applied as drench or foliar treatment generally provided mediocre activity on broad mite in a New Guinea impatiens trial. It generally provided efficacy on the Eriophyid Aceria sp. in a New Mexico olive test that was comparable to the standard Avid® + 1% SuffOil X. It provided excellent efficacy on hedge privet rust mites in a variegated privet trial. BYI 08330 provided good efficacy on twospotted spider mite in a marigold trial, and excellent efficacy in a strawberry trial. Movento provided excellent efficacy on citrus red mite in an orange trial.

Sulfur. Sulfur and Thiolux provided good efficacy on red palm mite in two coconut palm trials.

Tank-Mix:Chlorfenapyr + Horticultural Oil. Pylon + Ultra-Pure Oil provided excellent efficacy on broad mite in a New Guinea impatiens trial.

Tank-Mix:Chlorfenapyr + Petroleum Oil. Pylon + SuffOil X provided excellent efficacy on broad mite in a New Guinea impatiens trial.

Please see Table 47 for a list of all researchable studies and the summary of trials conducted from 2004 to 2011.

Phytotoxicity

No phytotoxicity was observed in any crop with the exception of New Guinea impatiens where the Pylon + Ultra-Pure oil combination showed severe leaf burn and bud injury after the second application; Pylon + Suffoil X also showed slight leaf burn, primarily at the leaf tips.

Table 47. Summary of product efficacy by pest and crop.

Note: Table entries are sorted by product, pathogen Latin name, and then by crop Latin name. Only those IR-4 trials received by 3/05/2012 are included in the table below.

PR #	Product (Active ingredient)	Target	Crop	Production Site	Researcher	Year	Application Type	Results
30186	Akari 5SC (Fenpyroximate)	Eriophyid Mite, Forestiera (Aceria sp.)	New Mexican Privet (Forestiera neomexicana)	Field Container	Grasswitz	2011	Spray to runoff	Significant control with 24 fl oz per 100 gal applied twice; comparable to, though slower-acting than, Avid + 1 % oil applied twice.
29780	Akari 5SC (Fenpyroximate)	Hedge privet rust mite (Aculus ligustri)	Privet, Variegated (Ligustrum sinense) Varigatum	Greenhouse	Uber	2010	Spray-to-wet	Excellent control after 2nd application at 24 fl oz per 100 gal.
29787	Avid 0.15EC (Abamectin)	Hedge privet rust mite (Aculus ligustri)	Privet, Variegated (Ligustrum sinense) Varigatum	Greenhouse	Uber	2010	Spray-to-wet	Excellent control at 4 fl oz per 100 gal + 415 Narrow Range Oil.
29563	Avid 0.15EC (Abamectin)	Broad Mite (Polyphagotarsonemus latus)	New Guinea Impatiens (Impatiens New Guinea hybrids) I. hawkeri 'Celebrette Purple'	Greenhouse	Gilrein	2010	Foliar	Excellent control at 8 fl oz per 100 gal; no injury or growth reduction.
27892	Avid 0.15EC (Abamectin)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008	Foliar	Test 1; Avid used: Significant reduction of red palm mite population up to 14 DAT with 4 oz per 100 gal.
27892	Avid 0.15EC (Abamectin)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008	Foliar	Test 2; AgriMek (Food Trade Name) used: Good to excellent control of red palm mite with 8 oz per 100 gal w/ or w/o surfactant.
27892	Avid 0.15EC (Abamectin)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Rodriquez	2008	Foliar	Did not significantly reduce red palm mite population with 4 oz per 100 gal.
30391	Emamectin Benzoate (Emamectin benzoate)	Eriophyid Mite, Forestiera (Aceria sp.)	New Mexican Privet (Forestiera neomexicana)	Field Container	Grasswitz	2011	Spray to runoff	Significant control with 4 and 8 fl oz per 100 gal applied twice; comparable to, though slower-acting than, Avid + 1 % oil applied twice.
30187	Hexygon (Hexythiazox)	Eriophyid Mite, Forestiera (Aceria sp.)	New Mexican Privet (Forestiera neomexicana)	Field Container	Grasswitz	2011	Spray to runoff	No control with 2 oz per 100 gal applied once.

PR #	Product (Active ingredient)	Target	Crop	Production Site	Researcher	Year	Application Type	Results
29781	Hexygon (Hexythiazox)	Hedge privet rust mite (Aculus ligustri)	Privet, Variegated (Ligustrum sinense) Varigatum	Greenhouse	Uber	2010	Spray-to-wet	Poor control at 2 oz per 100 gal.
27952	Hexygon (Hexythiazox)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008	Foliar	Product not included in trial.
27952	Hexygon (Hexythiazox)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Rodriquez	2008	Foliar	No significant reduction of red palm mite population at 14 DAT with 2 oz per 100 gal.
27562	Judo 2SC (Spiromesifen)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008		Product not included in trial.
27562	Judo 2SC (Spiromesifen)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Rodriquez	2008	Foliar	Excellent control of red palm mite population with 2 oz per 100 gal; best treatment.
30188	Kontos (BYI 8330 240SC) (Spirotetramat)	Eriophyid Mite, Forestiera (Aceria sp.)	New Mexican Privet (Forestiera neomexicana)	Field Container	Grasswitz	2011	Spray to runoff	Significant control with 3.4 fl oz per 100 gal applied twice; comparable to, though slower-acting than, Avid + 1 % oil applied twice.
29782	Kontos (BYI 8330 240SC) (Spirotetramat)	Hedge privet rust mite (Aculus ligustri)	Privet, Variegated (Ligustrum sinense) Varigatum	Greenhouse	Uber	2010	Spray-to-wet	Excellent control after 2nd application at 3.4 fl oz per 100 gal.
29558	Kontos (BYI 8330 240SC) (Spirotetramat)	Broad Mite (Polyphagotarsonemus latus)	New Guinea Impatiens (Impatiens New Guinea hybrids) I. hawkeri 'Celebrette Purple'	Greenhouse	Gilrein	2010	Drench	Fair control at 50 ml per 1100 pots; inferior to Avid; no injury or growth reduction.
29558	Kontos (BYI 8330 240SC) (Spirotetramat)	Broad Mite (Polyphagotarsonemus latus)	New Guinea Impatiens (Impatiens New Guinea hybrids) I. hawkeri 'Celebrette Purple'	Greenhouse	Gilrein	2010	Foliar	Fair control at 3.4 fl oz per 100 gal; inferior to Avid; no injury or growth reduction.
28933	Kontos (BYI 8330 240SC) (Spirotetramat)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Rodriquez	2008	Foliar	Product not included in trial.
30189	Magus (Fenazaquin)	Eriophyid Mite, Forestiera (Aceria sp.)	New Mexican Privet (Forestiera neomexicana)	Field Container	Grasswitz	2011	Spray to runoff	Significant control with 24 fl oz per 100 gal applied once; comparable to Avid + 1 % oil applied twice.

PR #	Product (Active ingredient)	Target	Crop	Production Site	Researcher	Year	Application Type	Results
30068	Magus (Fenazaquin)	Hedge privet rust mite (Aculus ligustri)	Privet, Variegated (Ligustrum sinense) Varigatum	Greenhouse	Uber	2010	Spray-to-wet	Excellent control after 2nd application at 24 fl oz per 100 gal.
29557	Magus (Fenazaquin)	Broad Mite (Polyphagotarsonemus latus)	New Guinea Impatiens (Impatiens New Guinea hybrids) I. hawkeri 'Celebrette Purple'	Greenhouse	Gilrein	2010	Foliar	Good control but short residual activity at 12 and 24 fl oz per 100 gal; inferior to Avid; no injury or growth reduction.
29559	MBI 203 DF (Chromobacterium subtsugae NRRL B-30655)	Broad Mite (Polyphagotarsonemus latus)	New Guinea Impatiens (Impatiens New Guinea hybrids) I. hawkeri 'Celebrette Purple'	Greenhouse	Gilrein	2010	Foliar	No efficacy at 1 % and 5 % conc.; no injury or growth reduction.
27765	Ovation SC (Clofentezine)	Mite, Southern red (Oligonychus ilicis)	Holly (Ilex sp.) 'Blue Princess'	Greenhouse	Gilrein	2007	Foliar	Excellent control with 8 fl oz per 100 gal; comparable to Floramite and Sanmite.
27893	Ovation SC (Clofentezine)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Rodriquez	2008	Foliar	Significantly reduced red palm mite population at 14 DAT with 2 oz per 100 gal; better than Avid.
29785	Proclaim 5SG (Emamectin benzoate)	Hedge privet rust mite (Aculus ligustri)	Privet, Variegated (Ligustrum sinense) Varigatum	Greenhouse	Uber	2010	Spray-to-wet	Excellent control after 2nd application at 4 and 8 oz per 100 gal.
29800	Proclaim 5SG (Emamectin benzoate)	Broad Mite (Polyphagotarsonemus latus)	New Guinea Impatiens (Impatiens New Guinea hybrids) I. hawkeri 'Celebrette Purple'	Greenhouse	Gilrein	2010	Foliar	Excellent control at 4 and 8 oz per 100 gal; equal to Avid; no injury or growth reduction.
29783	Pylon (Chlorfenapyr)	Hedge privet rust mite (Aculus ligustri)	Privet, Variegated (Ligustrum sinense) Varigatum	Greenhouse	Uber	2010	Spray-to-wet	Excellent control after 2nd application at 2.6 fl oz per 100 gal.
29560	Pylon (Chlorfenapyr)	Broad Mite (Polyphagotarsonemus latus)	New Guinea Impatiens (Impatiens New Guinea hybrids) I. hawkeri 'Celebrette Purple'	Greenhouse	Gilrein	2010	Foliar	Excellent control at 5.6 fl oz per 100 gal; equal to Avid; no injury or growth reduction.

PR #	Product (Active ingredient)	Target	Crop	Production Site	Researcher	Year	Application Type	Results
27561	Pylon (Chlorfenapyr)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008	Foliar	Good control of red palm mite with 5.2 fl oz per 100 gal.
27766	Sanmite (BASF) (Pyridaben)	Mite, Southern red (Oligonychus ilicis)	Holly (Ilex sp.) 'Blue Princess'	Greenhouse	Gilrein	2007	Foliar	Excellent control with 4 oz per 100 gal.
27953	Sanmite (BASF) (Pyridaben)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008	Foliar	Excellent control of red palm mite with 6 oz per 100 gal; best treatment.
27764	Shuttle 15SC (Acequinocyl)	Mite, Southern red (Oligonychus ilicis)	Holly (Ilex sp.) 'Blue Princess'	Greenhouse	Gilrein	2007	Foliar	Excellent control with 6.4 and 12.8 fl oz per 100 gal; comparable to Floramite and Sanmite.
27557	Shuttle 15SC (Acequinocyl)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008	Foliar	Good control of red palm mite with 12.8 oz per 100 gal.
29905	SuffOil X (Synergy) (Petroleum Oil)	Broad Mite (Polyphagotarsonemus latus)	New Guinea Impatiens (Impatiens New Guinea hybrids) I. hawkeri 'Celebrette Purple'	Greenhouse	Gilrein	2010	Foliar	Good control but short residual activity at 1 % conc.; inferior to Avid; no injury or growth reduction.
29561	Tank Mix: Pylon + Horticultural Oil (Chlorfenapyr + horticultural oil)	Broad Mite (Polyphagotarsonemus latus)	New Guinea Impatiens (Impatiens New Guinea hybrids) I. hawkeri 'Celebrette Purple'	Greenhouse	Gilrein	2010	Foliar	Excellent control at 5.6 fl oz per 100 gal + 1 % Ultra-Pure Oil; equal to Avid; severe leaf burn and bud injury.
29562	Tank Mix: Pylon + SuffOil X (Chlorfenapyr +)	Broad Mite (Polyphagotarsonemus latus)	New Guinea Impatiens (Impatiens New Guinea hybrids) I. hawkeri 'Celebrette Purple'	Greenhouse	Gilrein	2010	Foliar	Excellent control at 5.6 fl oz per 100 gal + 1 % Suffoil-X; equal to Avid; slight leaf injury.
27559	Tetrasan (Etoxazole)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008	Foliar	Test 1: Significant reduction of red palm mite population up to 14 DAT with 16 oz per 100 gal.
27559	Tetrasan (Etoxazole)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008	Foliar	Test 2: Good control of red palm mite with 16 oz per 100 gal.
27559	Tetrasan (Etoxazole)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Rodriquez	2008	Foliar	No significant reduction of red palm mite population at 14 DAT with 10 oz per 100 gal.
27950	Thiolux 80DF (Sulfur)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008	Foliar	Good control of red palm mite with 10 lb per 100 gal.

PR #	Product (Active ingredient)	Target	Crop	Production Site	Researcher	Year	Application Type	Results
29786	TickEx EC (Metarhizium anisophliae)	Hedge privet rust mite (Aculus ligustri)	Privet, Variegated (Ligustrum sinense) Varigatum	Greenhouse	Uber	2010	Spray-to-wet	Good to excellent control after 2nd application at 29 fl oz per 100 gal.
30190	Ultiflora (Milbemectin)	Eriophyid Mite, Forestiera (Aceria sp.)	New Mexican Privet (Forestiera neomexicana)	Field Container	Grasswitz	2011	Spray to runoff	Poor to no control with 16 fl oz per 100 gal applied twice.
29784	Ultiflora (Milbemectin)	Hedge privet rust mite (Aculus ligustri)	Privet, Variegated (Ligustrum sinense) Varigatum	Greenhouse	Uber	2010	Spray-to-wet	Excellent control at 16 fl oz per 100 gal; judged the best treatment.
27560	Ultiflora (Milbemectin)	Red Palm Mite (Raoiella indica)	Palm, Coconut (Cocos sp.)	Field Container	Pena	2008	Foliar	Mediocre control of red palm mite with 16 oz per 100 gal.

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