



[Environmental Horticulture Program Research Summaries](#)

IR-4 Environmental Horticulture Program Scale Efficacy

**Author: Cristi Palmer
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Acknowledgements

Susan Bierbrunner

Ely Vea

Diane Infante

Lori Harrison

Karen Sims

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Table of Contents

Table of Contents	2
Table of Tables	4
Abstract	7
Introduction.....	8
Materials and Methods.....	8
Results and Summary	12
Comparative Efficacy on Armored Scales.....	12
Camellia Scale	19
Cycad Scale.....	22
Elongate Hemlock and Cryptomeria Scales	22
Euonymus Scale.....	26
False Florida Red Scale	33
False Oleander Scale.....	35
Florida Red Scale.....	46
Gloomy Scale.....	47
Hemispherical Scale.....	49
Oystershell Scale.....	50
Pine Needle Scale.	51
Tea Scale.....	55
Wax Myrtle Scale	64
Winged Euonymus Scale	67
Comparative Efficacy on Cushion Scales.....	69
Cottony Cushion Scale.....	69
Comparative Efficacy on Felt Scales	74
Crapemyrtle Bark Scale.....	74
Comparative Efficacy on Lac Scales	80
Lobate Lac Scale.....	80
Comparative Efficacy on Palm Scales.....	82
Hala Scale.	82
Comparative Efficacy on Pit Scales.....	82
Holly Pit Scale	82
Comparative Efficacy on Soft Scales	85
Calico Scale.	88
Cottony Maple Scale.....	91
Fletcher Scale.....	92
Florida Wax Scale.....	93
Magnolia Scale.....	98
Efficacy Summary by Active Ingredient	100
A16901B.....	100
Aloft SC/Celero 16WSG.....	100
Altus/BYI-2960 200 SL.....	100
Azaguard.....	100
Botanigard ES.....	100

Bountify/MBI 306.....	100
BW133.....	100
BW238.....	100
Discus.....	100
Distance 0.86E.....	100
Flagship 0.22G/25WG.....	101
GF-2626 1SC.....	101
ISM-555.....	101
Kontos/Movento 240SC.....	101
KOC22018-8.....	101
Mainspring 200SC.....	101
MBI 203.....	101
MOI 201.....	101
Pradia/IKI-3326.....	101
Rycar/Rycar20SC.....	102
RTSA-721.....	102
Safari 2G/20SG/Transect 70WSP.....	102
Sarisa/IKI-3106.....	102
SP3014.....	102
Talus 40SC/70DF.....	102
TetraCURB.....	103
Transtech WSP.....	103
TriStar 30SG/70WSP.....	103
V-10433.....	103
Velifer.....	103
Ventigra.....	103
XXpire 40WG.....	103
Phytotoxicity.....	103
Appendix 1: Contributing Researchers.....	163

Table of Tables

Table 1.	List of Products and Rates Tested from 2004 to 2022	9
Table 2.	Comparative Efficacy for Armored Scale, Part 1	13
Table 3.	Comparative Efficacy for Armored Scale, Part 2.....	15
Table 4.	Comparative Efficacy for Armored Scale, Part 3.....	17
Table 5.	Efficacy on Camellia Scale on Camellia, Chong, SC, 2010.....	20
Table 6.	Efficacy on Camellia Scale on Camellia, Chong, SC, 2014.....	21
Table 7.	Efficacy on Cycad Scale (<i>Aulacaspis yasumatsui</i>) on Sago Palm (<i>Cycas revoluta</i>), Dale, 2019.....	23
Table 8.	Efficacy on Elongate Hemlock Scale and Cryptomeria Scale on Frasier Fir, Cowles, CT, 2005.	24
Table 9.	Efficacy on Elongate Hemlock Scale and Cryptomeria Scale and its Parasite <i>Encarsia citrina</i> on Frasier Fir, Cowles, CT, 2008.....	25
Table 10.	Efficacy on Euonymus Scale on Euonymus ‘Fortunei’, Nielsen, OH, 2007.....	26
Table 11.	Efficacy on Euonymus Scale on Euonymus ‘Sunspot’, Nielsen, OH, 2009.....	27
Table 12.	Efficacy on Euonymus Scale on Spindle Tree ‘Microphylla’, Frank, NC, 2009. ...	28
Table 13.	Efficacy on Euonymus Scale on Spindle Tree ‘Microphylla’, Frank, NC, 2010. ..	28
Table 14.	Efficacy on Euonymus Scale on Spindle Tree ‘Microphylla’, Ludwig, TX, 2009.	29
Table 15.	Efficacy on Euonymus Scale on Spindle Tree ‘Moonshadow’, Potter, KY, 2010.	30
Table 16.	Efficacy on Euonymus Scale on Wintercreeper, (<i>Euonymus fortunei</i>) ‘Radicans’, Kunkel, DE, 2011.	30
Table 17.	Efficacy on Euonymus Scale on Euonymus, (<i>Euonymus japonicus</i>) ‘Green Spire’, Gilrein, NY, 2011.	31
Table 18.	Efficacy on Euonymus Scale on Euonymus, Braman, GA, 2014.....	32
Table 19.	Efficacy on Euonymus Scale on Wintercreeper (<i>Euonymus fortunei</i>) ‘Emerald N Gold’, Potter, KY, 2014.....	32
Table 20.	Efficacy on False Florida Red Scale on Chinese Holly ‘Carissa’, Chong, SC, 2009. 34	
Table 21.	Efficacy on False Florida Red Scale on Chinese Holly, ‘Carissa’, Chong, SC, 2009. 34	
Table 22.	Efficacy on False Oleander Scale on Aucuba, Ludwig, TX, 2004.....	35
Table 23.	Efficacy on False Oleander Scale on Southern Magnolia, Chong, SC, 2010a.	37
Table 24.	Efficacy on False Oleander Scale on Southern Magnolia, Chong, SC, 2010b.....	38
Table 25.	Efficacy on False Oleander Scale on Southern Magnolia ‘Little Gem’, Braman, GA, 2012.....	38
Table 26.	Efficacy of Insecticides on Magnolia White Scale on Southern Magnolia (<i>M. grandiflora</i>), Chen, LA, 2014.	40
Table 27.	Efficacy on False Oleander Scale on Southern Magnolia, Chong, SC, 2014.....	40
Table 28.	Efficacy on False Oleander Scale (Adult Females) on Japanese Aucuba, Held, MS, 2018.	41
Table 29.	Efficacy on False Oleander Scale (All Stages) on Japanese Aucuba, Held, MS, 2018.	42
Table 30.	Number of Infested Leaves with Live False Oleander Scale on Japanese Aucuba, Held, MS, 2018.....	43
Table 31.	Efficacy on False Oleander Scale on Japanese Aucuba, Held, AL, 2019.	44

Table 32.	Efficacy on False Oleander Scale on Japanese Aucuba, Held, AL, 2019.	45
Table 33.	Efficacy on Florida Red Scale on Dwarf Burford Holly, Ludwig, TX, 2005.....	46
Table 34.	Efficacy on Gloomy Scale on Red Maple (<i>Acer rubrum</i>), Frank, NC, 2011.	48
Table 35.	Efficacy on Gloomy Scale on Red Maple (<i>Acer rubrum</i>), Frank, NC, 2014.	49
Table 36.	Efficacy for Hemispherical Scale on Coontie Cycads (<i>Zamia integrifolia</i>), Dale, NC, 2022.....	49
Table 37.	Efficacy on Oystershell Scale on Tree Lilac ‘Sensation’, Nielsen, OH, 2005.	50
Table 38.	Efficacy on Oystershell Scale on Carolina Silverbell, Nielsen, OH, 2005.....	50
Table 39.	Efficacy on Oystershell Scale on Carolina Silverbell, Nielsen, OH, 2008.....	51
Table 40.	Efficacy on Pine Needle Scale on Pine, Nielsen, OH, 2010.....	52
Table 41.	Efficacy on Pine Needle Scale on Pine, Nielsen, OH, 2011.....	52
Table 42.	Efficacy on Pine Needle Scale on Scotch Pine, Jones, OH, 2012.	53
Table 43.	Efficacy on Pine Needle Scale on White Pine (<i>Pinus strobus</i>), Sadof, IN, 2015a.	53
Table 44.	Efficacy on Pine Needle Scale on White Pine (<i>Pinus strobus</i>), Sadof, IN, 2015b.	54
Table 45.	Efficacy on Tea Scale on Dwarf Burford Holly ‘Burfordii Nana’, Hesselein, AL, 2009.	55
Table 46.	Efficacy on Tea Scale on Japanese Camellia (<i>Camellia japonica</i>), Ludwig, TX, 2009.	56
Table 47.	Efficacy on Tea Scale on Japanese Camellia, Frank, NC, 2010.....	56
Table 48.	Efficacy of Insecticides on Tea Scale on Sasanqua (<i>Camellia sasanqua</i>), Chen, LA, 2014.	57
Table 49.	Efficacy on Tea Scale on Japanese Camellia, (<i>Camellia japonica</i>) ‘In the Pink’ (Counts), Arthurs, FL, 2014.....	58
Table 50.	Efficacy on Tea Scale on Japanese Camellia, (<i>Camellia japonica</i>) ‘In the Pink’ (Infestation Index), Arthurs, FL, 2014.....	59
Table 51.	Efficacy on Tea Scale on Japanese Camellia, (<i>Camellia japonica</i>), Braman, GA, 2015.	61
Table 52.	Efficacy on Tea Scale on Japanese Camellia, (<i>Camellia japonica</i>), Chen, LA, 2015.	62
Table 53.	Efficacy on Tea Scale on Holly (<i>Ilex</i> sp.) ‘Nellie Stevens’, Chong, SC, 2015.....	63
Table 54.	Efficacy on Tea Scale on Holly (<i>Ilex</i> sp.), Frank, NC, 2015.....	64
Table 55.	Efficacy on Wax Myrtle Scale on Wax Myrtle, Chong, SC, 2008a.	65
Table 56.	Efficacy on Wax Myrtle Scale on Wax Myrtle, Chong, SC, 2008b.....	65
Table 57.	Efficacy on Wax Myrtle Scale on Wax Myrtle, Chong, SC, 2009a.	66
Table 58.	Efficacy on Wax Myrtle Scale on Wax Myrtle, Chong, SC, 2009b.....	66
Table 59.	Efficacy on Wax Myrtle Scale on Wax Myrtle, Chong, SC, 2014.....	67
Table 60.	Efficacy on Winged Euonymus Scale on Euonymus, Freiberger, NJ, 2004.	68
Table 61.	Efficacy on Euonymus Scale on Euonymus, Freiberger, NJ, 2005.....	68
Table 62.	Efficacy on Cottony Cushion Scale on Cleyera, Ludwig, TX, 2005.....	69
Table 63.	Efficacy on Cottony Cushion Scale on Heavenly Bamboo ‘Harbour Dwarf’, Frank, NC, 2011.....	70
Table 64.	Efficacy of Insecticides on Cottony Cushion Scale on Heavenly Bamboo ‘Harbour Dwarf’, Frank, NC, 2012.	71
Table 65.	Efficacy on Cottony Cushion Scale on Pittosporum ‘Variegata’, Chong, SC, 2011.	72

Table 66.	Efficacy on Cottony Cushion Scale on Pittosporum ‘Variegata’, Chong, SC, 2012. 73	
Table 67.	Efficacy on Crapemyrtle Bark Scale Crawlers on Crapemyrtles (<i>Lagerstroemia</i> sp.) ‘Natchez’, Vafaie, TX, 2018.....	75
Table 68.	Efficacy on CMBS Male Pupae and Egg Sacs on Crapemyrtles (<i>Lagerstroemia</i> sp.) ‘Natchez’, Vafaie, TX, 2018.....	76
Table 69.	Efficacy on Crapemyrtle Bark Scale Crawlers and Adults on Crapemyrtles (<i>Lagerstroemia</i> sp.), Held, AL, 2020.....	77
Table 70.	Efficacy on Crapemyrtle Bark Scale Total Population on Crapemyrtles (<i>Lagerstroemia</i> sp.), Held, AL, 2020.....	78
Table 71.	Efficacy on Crapemyrtle Bark Scale Crawlers and Adults on Crapemyrtles (<i>Lagerstroemia</i> sp.), Held, AL, 2021.....	79
Table 72.	Efficacy of Insecticides on Lobate Lac Scale on Hibiscus (<i>Hibiscus rosa-sinensis</i>) ‘Dainty White’, Cheng, HI, 2018.....	81
Table 73.	Efficacy for Hala Scale on Hala, Cheng, HI, 2019.....	82
Table 74.	Efficacy on Holly Pit Scale on Holly, ‘East Palatka’, Buss, FL, 2009.....	84
Table 75.	Comparative Efficacy for Soft Scale	86
Table 76.	Efficacy on Calico Scale on Japanese Zelkova, Potter, KY, 2007.	88
Table 77.	Efficacy of Systemic Insecticides on Calico Scale on Honeylocust (<i>Gleditzia</i> <i>triacanthos inermis</i>), Sadoff, IN, 2011.....	89
Table 78.	Efficacy of Foliar Insecticides on Calico Scale on Honeylocust (<i>Gleditzia</i> <i>triacanthos inermis</i>), Sadoff, IN, 2011.....	90
Table 79.	Efficacy of Foliar Insecticides on Calico Scale on Honeylocust (<i>Gleditzia</i> <i>triacanthos inermis</i>), ‘Skyline’ Sadoff, Carmel, IN, 2012.....	90
Table 80.	Efficacy of Foliar Insecticides on Calico Scale on Honeylocust (<i>Gleditzia</i> <i>triacanthos inermis</i>), ‘Skyline’ Sadoff, Indianapolis, IN, 2012.....	91
Table 81.	Efficacy of Insecticides on Calico Scale on Honeylocust (<i>Gleditzia triacanthos</i> <i>inermis</i>), Persad, OH, 2014.....	91
Table 82.	Efficacy on Cottony Maple Scale on Silver Maple, Smitley & Davis, MI, 2005...	92
Table 83.	Efficacy on Fletcher Scale on Yew, Smitley & Davis, MI, 2004.....	93
Table 84.	Efficacy on Florida Wax Scale (<i>Ceroplastes floridensis</i>) on Dwarf Burford Holly, Ludwig, TX, 2004.....	94
Table 85.	Efficacy on Florida Wax Scale (<i>Ceroplastes floridensis</i>) on Dwarf Burford Holly, Ludwig, TX, 2005a.....	95
Table 86.	Efficacy on Florida Wax Scale (<i>Ceroplastes floridensis</i>) on Holly ‘China Doll’, Ludwig, TX, 2005b.....	96
Table 87.	Efficacy on Florida Wax Scale (<i>Ceroplastes floridensis</i>) on Holly ‘Needlepoint’, Held, AL, 2009.....	97
Table 88.	Efficacy on Florida Wax Scale (<i>Ceroplastes floridensis</i>) on Indian Hawthorn, Ludwig, TX, 2005.....	97
Table 89.	Efficacy on Magnolia Scale on <i>Magnolia grandiflora</i> ‘Bracken’s Brown Beauty’, Chong, SC, 2020.....	99
Table 90.	Summary of Efficacy by Product for Scale	104

Abstract

Managing scale insects presents unique challenges. Products with contact modes of action must be applied at specific timings in order to reach the most susceptible crawler stages. Products with systemic modes of action may work well for certain species and not others based on application timing and whether the insect feeds within phloem. In 2003, IR-4 initiated a high priority project to determine efficacy of several insecticides on several scale and mealybug species so data can be obtained to add appropriate species to existing registrations. This research was conducted between 2004 and 2022, and this summary contains outcomes from 85 experiments received through the IR-4 Environmental Horticulture Program. Across the 24 scale species screened, the most efficacious products included ISM-555, RTSA-721, XXpire, horticultural oils, Talus, Rycar, Distance, Safari, Ventigra, dimethoate. Kontos, Tristar, Altus, Flagship, Mainspring, and Marathon also reduced populations. However, sensitivities across species varied by product and application method.

Introduction

Managing scale insects presents unique challenges. Products with contact modes of action should be applied at specific timings in order to reach the most susceptible crawler stages. Products with systemic modes of action may work well for certain species and not others based on application timing and whether the insect feeds within phloem or xylem. In 2003, IR-4 initiated a high priority project to determine efficacy of several insecticides on several scale and mealybug species so data can be obtained to add appropriate species to existing registrations. This research was conducted during 2004 and continued through 2022. This summary includes available data from 85 scale efficacy experiments received through the IR-4 Environmental Horticulture Program.

Materials and Methods

Several neonicotinoids (Aloft SC/Celero 16WSG, Flagship 0.22G/25WP, Safari 2G/20SG, and TriStar 30SG/70WSP) and insect growth regulators (Distance and Talus 40SC) were tested against scales and mealybugs. Other products, including A16901B, Aria 50SG, BAS 440/Ventigra, BotaniGard ES, BW133, BW238, BYI-2960/Altus GF-2626 1SC, IKI-3106/Sarisa, IKI-3326/Pradia, ISM555, KOC22018-8, Kontos (BYI 8330), Mainspring, MBI-203, MBI 205, MBI-306, and Rycar 20SC, SP3014, TetraCURB, V-10433, Velifer and Xxpire 40WG, were also included in some studies. Two foliar applications of insecticides were made approximately 14 days apart. Safari, Flagship and Mainspring were also applied as container drench, in-ground drench, trunk spray, soil broadcast, or media mix. A minimum of four plants (replicate treatments) were required with most researchers exceeding this minimum. Insect counts were recorded pre-treatment and then 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: 05-002, 07-024, 08-009, 09-009, 10-005, 10-006, 11-018, 11-019, 12-003, 12-004, 14-006, 14-007, 15-006, 17-007, 18-010, 19-010, 20-004, 21-004 and 22-006. 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.

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.

Table 1. List of Products and Rates Tested from 2004 to 2022

Product	Manufacturer	Active Ingredients	Code Numbers	MOA Class	Application Type	# Experiments
A16901B 45WG	Syngenta Crop Protection	Thiamethoxam + cyantraniliprole	A16901B	IRAC 4A + IRAC 28	Drench	11
					Foliar	2
Acelepryn (Dupont)	Dupont Crop Protection	Chlorantraniliprole	DPX-E2Y45	IRAC 28	Foliar	1
Acephate Pro 75 WSP	MicroFlo	Acephate		IRAC 1B	Foliar	1
Aloft SC	Arysta	Clothianadin + bifenthrin		IRAC 4A + IRAC 3	Foliar	2
					SprencH	5
Altus	Envu (formerly Bayer)	Flupyradifurone	BYI-2960	IRAC 4D	Foliar	11
Arena 50WDG	Valent USA	Clothianadin		IRAC 4A	Drench	4
AzaGuard	BioSafe Systems	Azadirachtin		IRAC UN	Foliar	8
Botanigard 22WP	Laverlam International	Beauveria bassiana Strain GHA		IRAC UNF	Foliar	1
Bountify (MBI 306)	Pro Farm Group (formerly Marrone Bio Innovations)	Burkholderia rinojensis strain A396	MBI 306	FRAC NC & IRAC UNB	Foliar	3
BW133	Bioworks	BW133	BW133	FRAC NC	Foliar	1
BW238 ES	Bioworks	BW238 ES	BW149, BW238		Foliar	1
BW238 WP	Bioworks	BW238 WP	BW149, BW238		Foliar	1
Celero 16W5G	Arysta	Clothianadin		IRAC 4A	Foliar	5
Diazinon 4E	Gowan	Diazinon		IRAC 1B	Foliar	2
Discus	OHP	Imidacloprid + cyfluthrin		IRAC 4A + IRAC 3A	Banded	1
					Foliar	1
Distance	Valent USA	Pyriproxyfen		IRAC 7C	Foliar	39
Dursban Pro	Dow AgroSciences	Chlorpyrifos		IRAC 1B	Foliar	1
Flagship 0.22G	Syngenta Crop Protection	Thiamethoxam		IRAC 4A	Broadcast	17
					Drench	1
					Top Dress	1
Flagship 25WG	Syngenta Crop Protection	Thiamethoxam	CGA 293343	IRAC 4A	Banded	1
					Drench	13
					Foliar	21
GF-2626 1SC	Dow AgroSciences	Sulfoxaflor		IRAC 4C	Foliar	4
ISM-555	Syngenta Crop Protection	ISM-555, A21377X	ISM-555		Foliar	3
Judo 2SC	OHP	Spiromesifen		IRAC 23	Foliar	1
KOC22018-8	Kemin Crop Technologies	Botanical Oil Blend			Foliar	3
Kontos 240SC	OHP	Spirotetramat	BYI 8330	IRAC 23	Drench	1
					Foliar	15
Mainspring GNL 200SC	Syngenta Crop Protection	Cyantraniliprole	A20520A, DPX-HGW86, DPX-HGW87	IRAC 28	Drench	14
					Foliar	4
Marathon II/Merit 2F	OHP, Envu (formerly Bayer)	Imidacloprid		IRAC 4A	Drench	2

Product	Manufacturer	Active Ingredients	Code Numbers	MOA Class	Application Type	# Experiments
					Foliar	2
MBI 203 SC2	Pro Farm Group (formerly Marrone Bio Innovations)	MBI 203	MBI 203		Foliar	3
Merit 75WP	Envu (formerly Bayer)	Imidacloprid		IRAC 4A	Drench	1
					Trunk spray	1
MOI 201	Pro Farm Group (formerly Marrone Bio Innovations)	MOI 201	MOI 201	FRAC NC	Foliar	1
Onyx	FMC	Bifenthrin		IRAC 3A	Foliar	1
Orthene TTO 97 (Valent)	Valent USA	Acephate		IRAC 1B	Foliar	15
Pradia	OHP	Cyclaniliprole + Flonicamid	IKI-3326	IRAC 28 + IRAC 29	Foliar	6
QRD 452	AgraQuest	Extract of Chenopodium ambrosioides	QRD 452	IRAC UNE	Foliar	1
RTSA 721	Rainbow Treecare Scientific	RTSA 721	RTSA 721		Basal spray	1
					Drench	3
Rycar	SePRO Corporation	Pyrifluquinazon	SP3009, NNI-0101	IRAC UN	Foliar	17
Safari 20SG	Valent USA	Dinotefuran		IRAC 4A	Banded	1
					Bark spray	1
					Drench	38
					Foliar	14
					Soil Injection	2
					Sprench	1
Safari 2G	Valent USA	Dinotefuran	V-10112 2G	IRAC 4A	Trunk spray	4
					Broadcast	14
					Drench	1
					Soil incorporation	2
					Top Dress	2
Saf-T-Oil	Unknown	Horticultural Oil		FRAC NC	Foliar	1
Sarisa 50SL	OHP	Cyclaniliprole	IKI-3106	IRAC 28	Foliar	13
SP3014	SePRO Corporation	SP3014	SP3014		Foliar	3
SuffOil X (Synergy)	Bioworks	Petroleum Oil	BW280	FRAC NC	Foliar	4
Sun Spray Ultra-Fine Spray Oil	No Manufacturer	Paraffinic oil		FRAC NC	Foliar	3
Talstar Flowable Insecticide/Miticide	FMC	Bifenthrin		IRAC 3A	Foliar	2
Talus 40SC	SePRO Corporation	Buprofezin		IRAC 16	Foliar	22
Talus 70DF	SePRO Corporation	Buprofezin		IRAC 16	Foliar	32
Talus WP	SePRO Corporation	Buprofezin		IRAC 16	Foliar	2
TetraCURB Concentrate	Kemin Crop Technologies	Rosemary Oil		IRAC UNE	Foliar	3
TetraCURB Max	Kemin Crop Technologies	castor oil + rosemary oil + clove oil + peppermint oil		IRAC UNE	Foliar	1
TetraCURB Organic	Kemin Crop Technologies	Rosemary Oil		IRAC UNE	Foliar	3

Product	Manufacturer	Active Ingredients	Code Numbers	MOA Class	Application Type	# Experiments
Triact	Certis USA	Clarified hydrophobic extract of neem oil		IRAC UN	Foliar	2
TriStar 30SG	NuFarm	Acetamiprid		IRAC 4A	Foliar	25
TriStar 70WSP	Cleary	Acetamiprid		IRAC 4A	Foliar	11
TriStar 8.5SL	NuFarm	Acetamiprid		IRAC 4A	Foliar	1
Ultra Pure Oil (BASF)	BASF Corporation	Petroleum Oil		FRAC NC	Foliar	1
V-10433	Valent USA	V-10433	V-10433		Foliar	3
Velifer	BASF Corporation	Beauveria bassiana Strain PPRI 5339		IRAC UNF	Foliar	1
Ventgra Insecticide	BASF Corporation	Afidopyropen	BAS 440 00I	IRAC 9D	Foliar	12
Xxpire 40WG	Corteva Agriscience	Spinetoram + sulfoxaflor	GF-2860	IRAC 5 + IRAC 4C	Foliar	17

** Product not registered for the production of environmental horticulture crops.

Results and Summary

Comparative Efficacy on Armored Scales

Management of armored scales (Insect Family: Diaspididae) is particularly challenging because foliar applications need to target the immature crawler stage when scales are most vulnerable to contact materials and systemic applications need to occur when the active ingredients will move through the phloem at the time when adult scales are feeding.

Fifty-one experiments were conducted between 1983 and 2019 within the IR-4 network. Across armored scale species, the most efficacious products in 3 or more experiments were horticulture oils, XXpire, Talus, dimethoate, Safari, Distance, Kontos, diazinon, and Mainspring. Rycar, Altus and Ventigra also performed well in most experiments. (Table 2, Table 3)

Please see below for research outcomes starting in 2004 by scale species.

Table 2. Comparative Efficacy for Armored Scale, Part 1

Product (Active Ingredients)	MOA	Scale, Cycad (<i>Aulacaspis yasumatsui</i>)	Florida Red Scale (<i>Chrysomphalus aonidum</i>)	False Florida Red Scale (<i>Chrysomphalus bifasciculatus</i>)	Scale, Oystershell (<i>Diaspidiotus ostreiformis</i>)	Scale, Elongate Hemlock (<i>Fiorinia externa</i>)	Scale, Tea (<i>Fiorinia theae</i>)
Aloft SC (Clothianadin + bifenthrin)	IRAC 4A + IRAC 3				1.0 (1 - 1) n1 Labeled		
Altus (Flupyradifurone)	IRAC 4D	3.0 (3 - 3) n1 Labeled					3.0 (1 - 5) n3 Labeled
AzaGuard (Azadirachtin)	IRAC UN	1.0 (1 - 1) n1					3.0 (3 - 3) n1
Botanigard 22WP (Beauveria bassiana Strain GHA)	IRAC UNF					1.0 (1 - 1) n1	
Celero 16WSG (Clothianadin)	IRAC 4A		1.0 (1 - 1) n1 Labeled				
Cygon 2E (Dimethoate)	IRAC 1B					3.0 (3 - 3) n2 Labeled	
Distance (Pyriproxyfen)	IRAC 7C			3.0 (3 - 3) n1 Labeled			3.0 (1 - 5) n5 Labeled
Flagship 25WG (Thiamethoxam)	IRAC 4A		1.0 (1 - 1) n1 Labeled	5.0 (5 - 5) n1 Labeled	1.0 (1 - 1) n2 Labeled	4.0 (4 - 4) n1 Labeled	
Judo 2SC (Spiromesifen)	IRAC 23					1.0 (1 - 1) n1	
KOC22018-8 (Botanical Oil Blend)	unknown	1.0 (1 - 1) n1					
Kontos 240SC (Spirotetramat)	IRAC 23						5.0 (5 - 5) n1 Labeled
Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28						3.0 (1 - 5) n6
MOI 201 (MOI 201)	FRAC NC				1.0 (1 - 1) n1		
Onyx (Bifenthrin)	IRAC 3A					2.0 (2 - 2) n1 Labeled	
Orthene TTO 97 (Valent) (Acephate)	IRAC 1B		1.0 (1 - 1) n1 Labeled		1.0 (1 - 1) n2 Labeled		
Pradia (Cyclaniliprole + Flonicamid)	IRAC 28 + IRAC 29	1.0 (1 - 1) n1					
Rycar (Pyriproxyfen)	IRAC UN			3.0 (3 - 3) n1			
Safari 20SG (Dinotefuran)	IRAC 4A		1.0 (1 - 1) n2 Labeled	5.0 (5 - 5) n1 Labeled	2.8 (1 - 5) n5 Labeled	3.8 (2 - 5) n4 Labeled	4.5 (3 - 5) n4 Labeled

Product (Active Ingredients)	MOA	Scale, Cycad (<i>Aulacaspis yasumatsui</i>)	Florida Red Scale (<i>Chrysomphalus aonidum</i>)	False Florida Red Scale (<i>Chrysomphalus bifasciculatus</i>)	Scale, Oystershell (<i>Diaspidiotus ostreiformis</i>)	Scale, Elongate Hemlock (<i>Fiorinia externa</i>)	Scale, Tea (<i>Fiorinia theae</i>)
Safari 2G (Dinotefuran)	IRAC 4A						3.0 (1 - 5) n3 Labeled
Saf-T-Oil (Mineral oil)	FRAC NC						3.0 (3 - 3) n1
Sarisa 50SL (Cyclaniliprole)	IRAC 28	1.0 (1 - 1) n1					3.3 (1 - 5) n4
SP3014 (SP3014)	unknown						
SuffOil X (Synergy) (Mineral oil)	FRAC NC						4.0 (3 - 5) n2
Talus 40SC (Buprofezin)	IRAC 16			3.0 (3 - 3) n1 Labeled	5.0 (5 - 5) n2 Labeled	4.0 (4 - 4) n1 Labeled	4.0 (4 - 4) n1 Labeled
Talus 70DF (Buprofezin)	IRAC 16	5.0 (5 - 5) n1 Labeled					3.7 (2 - 5) n7 Labeled
Tank Mix: Distance + TriStar (Pyriproxifen + acetamiprid)	IRAC 7C + IRAC 4A						3.3 (1 - 5) n4
TetraCURB Concentrate (Rosemary Oil)	IRAC UNE	1.0 (1 - 1) n1					
TetraCURB Organic (Rosemary Oil)	IRAC UNE	1.0 (1 - 1) n1					
Triact (Clarified hydrophobic extract of neem oil)	IRAC UN						1.0 (1 - 1) n1 Labeled
TriStar 30SG (Acetamiprid)	IRAC 4A		1.0 (1 - 1) n1 Labeled	3.0 (3 - 3) n1 Labeled	1.0 (1 - 1) n1 Labeled		
TriStar 70WSP (Acetamiprid)	IRAC 4A				2.0 (1 - 3) n2 Labeled	4.0 (4 - 4) n1 Labeled	
Ultra Pure Oil (BASF) (Mineral oil)	FRAC NC						4.0 (4 - 4) n1
Ventigra Insecticide (Afidopyropen)	IRAC 9D	5.0 (5 - 5) n1 Labeled					2.7 (1 - 4) n3 Labeled
Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C						5.0 (5 - 5) n2 Labeled

Average rating on a scale of 1 – 5 with 1 = 0 to about 70% efficacy and 5 = 100 efficacy or equivalent to non-inoculated control; minimum to maximum rating; number of trials. A rating of 2 or lower is considered unacceptable. A rating of 3 or higher is considered commercially acceptable. For insect/product combinations that are blank, IR-4 has not screened this combination.

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Table 3. Comparative Efficacy for Armored Scale, Part 2

Product (Active Ingredients)	MOA	Camelia Scale (Lepidosaphes camelliae)	Winged Euonymus Scale (Lepidosaphes yanagicola)	Wax Myrtle Scale (Melanaspis deklei)	Gloomy Scale (Melanaspis tenebricosa)	Pine Needle Scale (Phenacaspis pinifoliae)	False Oleander Scale (Pseudaulacaspis cockerelli)
A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	1.0 (1 - 1) n1 Labeled			5.0 (5 - 5) n1 Labeled	1.0 (1 - 1) n2 Labeled	1.0 (1 - 1) n1 Labeled
Aloft SC (Clothianadin + bifenthrin)	IRAC 4A + IRAC 3					5.0 (5 - 5) n1 Labeled	
Altus (Flupyradifurone)	IRAC 4D					2.0 (2 - 2) n1 Labeled	2.0 (1 - 3) n2 Labeled
Arena 50WDG (Clothianadin)	IRAC 4A	1.0 (1 - 1) n1					2.0 (2 - 2) n1
AzaGuard (Azadirachtin)	IRAC UN						1.7 (1 - 3) n3
Diazinon 4E (Diazinon)	IRAC 1B		1.0 (1 - 1) n1 Labeled				
Distance (Pyriproxyfen)	IRAC 7C	5.0 (5 - 5) n1 Labeled	2.0 (2 - 2) n1 Labeled	2.0 (1 - 3) n2 Labeled	5.0 (5 - 5) n1 Labeled	4.0 (3 - 5) n2 Labeled	2.5 (1 - 5) n4 Labeled
Flagship 0.22G (Thiamethoxam)	IRAC 4A	1.0 (1 - 1) n1			5.0 (5 - 5) n1	1.0 (1 - 1) n3	2.0 (2 - 2) n1
Flagship 25WG (Thiamethoxam)	IRAC 4A	1.0 (1 - 1) n1 Labeled	3.0 (3 - 3) n2 Labeled		5.0 (5 - 5) n1 Labeled	2.0 (1 - 3) n2 Labeled	2.0 (2 - 2) n2 Labeled
GF-2626 1SC (Sulfoxaflor)	IRAC 4C					2.0 (2 - 2) n1	
Horticultural Oil (Mineral oil)	FRAC NC					1.5 (1 - 2) n2	
KOC22018-8 (Botanical Oil Blend)	unknown						3.0 (3 - 3) n1
Kontos 240SC (Spirotetramat)	IRAC 23	5.0 (5 - 5) n1 Labeled	2.0 (2 - 2) n1 Labeled		5.0 (5 - 5) n1 Labeled	2.5 (1 - 5) n4 Labeled	1.0 (1 - 1) n1 Labeled
Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	1.0 (1 - 1) n1				1.5 (1 - 2) n2	5.0 (5 - 5) n1
Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	1.0 (1 - 1) n1 Labeled	3.0 (3 - 3) n1 Labeled				1.0 (1 - 1) n1 Labeled
Paraffin Oil (Mineral oil)	FRAC NC	5.0 (5 - 5) n1		3.0 (3 - 3) n1			4.0 (4 - 4) n1
Pradia (Cyclaniliprole + Flonicamid)	IRAC 28 + IRAC 29						2.5 (1 - 4) n2
Rycar (Pyrifluquinazon)	IRAC UN				5.0 (5 - 5) n1	4.5 (4 - 5) n2	2.0 (2 - 2) n1
Safari 20SG (Dinotefuran)	IRAC 4A	1.0 (1 - 1) n1 Labeled	1.0 (1 - 1) n3 Labeled	3.0 (3 - 3) n2 Labeled	5.0 (5 - 5) n1 Labeled	3.3 (1 - 5) n4 Labeled	3.0 (2 - 4) n2 Labeled

Product (Active Ingredients)	MOA	Camelia Scale (Lepidosaphes camelliae)	Winged Euonymus Scale (Lepidosaphes yanagicola)	Wax Myrtle Scale (Melanaspis deklei)	Gloomy Scale (Melanaspis tenebricosa)	Pine Needle Scale (Phenacaspis pinifoliae)	False Oleander Scale (Pseudaulacaspis cockerelli)
Safari 2G (Dinotefuran)	IRAC 4A	1.0 (1 - 1) n1 Labeled			5.0 (5 - 5) n1 Labeled	2.0 (1 - 3) n2 Labeled	3.0 (3 - 3) n1 Labeled
Sarisa 50SL (Cyclaniliprole)	IRAC 28					1.5 (1 - 2) n2	1.5 (1 - 2) n2
SuffOil X (Synergy) (Mineral oil)	FRAC NC						5.0 (5 - 5) n1
Sun Spray Ultra-Fine Spray Oil (Mineral oil)	FRAC NC			3.0 (3 - 3) n1		5.0 (5 - 5) n1	
Talus 40SC (Buprofezin)	IRAC 16		5.0 (5 - 5) n2 Labeled	3.0 (3 - 3) n2 Labeled			1.0 (1 - 1) n1 Labeled
Talus 70DF (Buprofezin)	IRAC 16	5.0 (5 - 5) n1 Labeled			5.0 (5 - 5) n1 Labeled	5.0 (5 - 5) n3 Labeled	2.5 (1 - 5) n4 Labeled
TetraCURB Concentrate (Rosemary Oil)	IRAC UNE						1.0 (1 - 1) n1
TetraCURB Organic (Rosemary Oil)	IRAC UNE						1.0 (1 - 1) n1
TriStar 30SG (Acetamiprid)	IRAC 4A	1.0 (1 - 1) n1 Labeled			5.0 (5 - 5) n1 Labeled	5.0 (5 - 5) n2 Labeled	1.0 (1 - 1) n1 Labeled
TriStar 70WSP (Acetamiprid)	IRAC 4A		2.5 (2 - 3) n2 Labeled				1.0 (1 - 1) n1 Labeled
TriStar 8.5SL (Acetamiprid)	IRAC 4A						1.0 (1 - 1) n1
Ventigra Insecticide (Afidopyropen)	IRAC 9D					5.0 (5 - 5) n1 Labeled	1.0 (1 - 1) n2 Labeled
Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	5.0 (5 - 5) n1 Labeled		2.0 (2 - 2) n1 Labeled		3.0 (3 - 3) n2 Labeled	4.0 (3 - 5) n2 Labeled

Average rating on a scale of 1 – 5 with 1 = 0 to about 70% efficacy and 5 = 100 efficacy or equivalent to non-inoculated control; minimum to maximum rating; number of trials. A rating of 2 or lower is considered unacceptable. A rating of 3 or higher is considered commercially acceptable. For insect/product combinations that are blank, IR-4 has not screened this combination.

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Table 4. Comparative Efficacy for Armored Scale, Part 3

Product (Active Ingredients)	MOA	Hemispherical Scale (<i>Saissetia coffeae</i>)	Euonymus Scale (<i>Unaspis euonymi</i>)
A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28		2.3 (1 - 5) n3 Labeled
Acephate Pro 75 WSP (Acephate)	IRAC 1B		5.0 (5 - 5) n1 Labeled
Aloft SC (Clothianadin + bifenthrin)	IRAC 4A + IRAC 3		4.0 (3 - 5) n2 Labeled
Bountify (MBI 306) (<i>Burkholderia rinojensis</i> strain A396)	FRAC NC & IRAC UNB	2.0 (2 - 2) n1	
Cygon 2E (Dimethoate)	IRAC 1B		3.7 (3 - 5) n3 Labeled
Diazinon 4E (Diazinon)	IRAC 1B		5.0 (5 - 5) n1 Labeled
Distance (Pyriproxyfen)	IRAC 7C		3.9 (1 - 5) n10 Labeled
Flagship 0.22G (Thiamethoxam)	IRAC 4A		2.2 (1 - 4) n6
Flagship 25WG (Thiamethoxam)	IRAC 4A		2.3 (1 - 4) n8 Labeled
Horticultural Oil (Mineral oil)	FRAC NC		4.3 (3 - 5) n3
ISM-555 (ISM-555, A21377X)	unknown	4.0 (4 - 4) n1	
Kontos 240SC (Spirotetramat)	IRAC 23		2.0 (1 - 3) n3 Labeled
Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	1.0 (1 - 1) n1	3.0 (1 - 5) n2
MBI 203 SC2 (MBI 203)	unknown	1.0 (1 - 1) n1	
Orthene TTO 97 (Valent) (Acephate)	IRAC 1B		3.0 (2 - 4) n2 Labeled
QRD 452 (Extract of <i>Chenopodium ambrosioides</i>)	IRAC UNE		3.0 (3 - 3) n1
Rycar (Pyriproxyfen)	IRAC UN		2.6 (1 - 5) n7
Safari 20SG (Dinotefuran)	IRAC 4A		3.8 (1 - 5) n11 Labeled

Product (Active Ingredients)	MOA	Hemispherical Scale (<i>Saissetia coffeae</i>)	Euonymus Scale (<i>Unaspis euonymi</i>)
Safari 2G (Dinotefuran)	IRAC 4A		4.0 (2 - 5) n5 Labeled
SP3014 (SP3014)	unknown	3.0 (3 - 3) n1	
Sun Spray Ultra-Fine Spray Oil (Mineral oil)	FRAC NC		5.0 (5 - 5) n1
Talus 40SC (Buprofezin)	IRAC 16	3.0 (3 - 3) n1 Labeled	4.3 (3 - 5) n4 Labeled
Talus 70DF (Buprofezin)	IRAC 16		4.0 (1 - 5) n6 Labeled
Talus WP (Buprofezin)	IRAC 16		5.0 (5 - 5) n1 Labeled
TetraCURB Max (castor oil + rosemary oil + clove oil + peppermint oil)	unknown	4.0 (4 - 4) n1	
TetraCURB Organic (Rosemary Oil)	IRAC UNE		
Triact (Clarified hydrophobic extract of neem oil)	IRAC UN		4.0 (4 - 4) n1 Labeled
TriStar 30SG (Acetamiprid)	IRAC 4A		2.6 (1 - 5) n8 Labeled
V-10433 (V-10433)	unknown	1.0 (1 - 1) n1	
Velifer (<i>Beauveria bassiana</i> Strain PPRI 5339)	IRAC UNF	3.0 (3 - 3) n1	
Ventigra Insecticide (Afidopyropen)	IRAC 9D	3.0 (3 - 3) n1 Labeled	
Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C		3.5 (2 - 5) n2 Labeled

Average rating on a scale of 1 – 5 with 1 = 0 to about 70% efficacy and 5 = 100 efficacy or equivalent to non-inoculated control; minimum to maximum rating; number of trials. A rating of 2 or lower is considered unacceptable. A rating of 3 or higher is considered commercially acceptable. For insect/product combinations that are blank, IR-4 has not screened this combination.

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Camellia Scale

In 2010, Chong investigated the efficacy of systemic neonicotinoids (Arena, Flagship, Safari and Tristar) and A16901B for the control of camellia scale (*Lepidosaphes camelliae*) on camellia (*Camellia japonica*). A16901B, Arena, Flagship 25WG and Safari 20SG were applied as drench while Flagship 0.22G and Safari 2G were applied as broadcast on Sept 9; Orthene and Tristar were applied as foliar spray on Sept 9 and 24. No significant difference in the percent mortality of nymphs among the treatments was observed, and significant difference in the percent mortality of adult camellia scales was observed only at 6 WAT (Table 5). Safari 2G was the only treatment that provided significantly higher mortality from the Nontreated control (20% difference). Unfavorable rainfall conditions during the experiment might have contributed to the poor performance of products. More research is needed to determine viable product choices for this species.

In 2014, Chong evaluated the efficacy of GF-2860/XXpire, Mainspring, Distance, Talus 70DF, Kontos and paraffinic oil against the camellia scale. Treatments were targeted on the emergence of crawlers. Mainspring was applied as soil drench on Jun 13 and Jul 11, while other products were applied as foliar spray. Talus 70DF was applied on Jun 13, GF-2860 + Capsil, Kontos and paraffinic oil applied on Jun 13 and 27, and Distance applied on Jun 13 and Jul 3. Overall, XXpire at 2.75 and 3.5 oz/100 gal, Distance, Kontos and paraffinic oil provided consistent and high efficacy against the camellia scales in outdoor, landscape situation (Table 6). One application of Talus 70DF did not significantly reduced the numbers of nymphs at 28 DAT; however, when considering the total number of camellia scales, Talus performed as well as the effective products before 28 DAT. It is therefore prudent to make a second Talus application at 28 DAT or during the time of crawler emergence of the next generation to achieve long-term reduction in the scale insect population. Performance of Mainspring was inconsistent, indicating that it may not provide sufficient suppression when applied as soil drench.

No phytotoxicity or insecticide residue was observed on the treated camellia shrubs.

Table 5. Efficacy on Camellia Scale on Camellia, Chong, SC, 2010.

Scale Stage	Treatment	Rate	Average Percent Mortality				
			Pretreat	1 WAT	2 WAT	4 WAT	6 WAT
Nymphs	A16901B	10 oz/100 gal	63.6 ± 3.1	66.1 ± 4.8	79.1 ± 3.9	77.0 ± 4.6	64.6 ± 7.7
	Arena 50 WDG	2.4 g/ft ht	58.7 ± 7.8	56.3 ± 5.5	80.3 ± 4.5	68.7 ± 8.5	74.0 ± 5.8
	Flagship 0.22G	227 g/ft ht	56.1 ± 4.7	64.9 ± 8.9	77.4 ± 5.2	78.7 ± 4.1	71.9 ± 10.3
	Flagship 25WG	1 g/ft ht	64.5 ± 3.3	58.2 ± 10.8	82.6 ± 3.9	79.7 ± 1.7	76.7 ± 4.2
	Flagship 25WG	4 g/ft ht	59.0 ± 3.8	76.8 ± 4.0	82.2 ± 3.8	76.5 ± 1.9	72.3 ± 3.2
	Orthene TTO	8 oz/100 gal	60.9 ± 4.1	69.4 ± 3.8	82.0 ± 5.0	78.6 ± 7.4	75.5 ± 9.1
	Safari 2G	60 g/ft ht	64.7 ± 4.8	67.5 ± 5.4	87.1 ± 4.3	79.6 ± 3.0	81.2 ± 5.3
	Safari 20SG	6 g/ft ht	62.6 ± 4.2	81.3 ± 3.9	82.6 ± 5.2	83.2 ± 4.5	68.8 ± 5.2
	Tristar 30SG + Capsil	8 oz + 6 fl oz/100 gal	53.0 ± 4.4	65.3 ± 4.2	81.5 ± 5.8	71.7 ± 4.6	73.5 ± 11.2
	Nontreated	-	58.5 ± 6.6	64.1 ± 6.3	74.1 ± 5.4	75.9 ± 6.2	83.2 ± 4.2
Adults	A16901B	10 oz/100 gal	32.6 ± 4.2	36.9 ± 6.6	44.7 ± 13.1	47.9 ± 3.4	32.0 ± 5.3 d
	Arena 50 WDG	2.4 g/ft ht	40.6 ± 7.5	44.8 ± 10.2	45.6 ± 4.7	54.6 ± 5.8	49.3 ± 5.1 bcd
	Flagship 0.22G	227 g/ft ht	35.4 ± 7.8	44.6 ± 10.3	43.3 ± 12.3	52.4 ± 4.9	53.0 ± 5.1 bc
	Flagship 25WG	1 g/ft ht	44.0 ± 5.3	31.5 ± 6.9	46.4 ± 4.1	49.8 ± 4.1	45.7 ± 3.4 cd
	Flagship 25WG	4 g/ft ht	28.4 ± 4.3	49.7 ± 4.2	48.9 ± 4.3	54.5 ± 7.7	65.1 ± 1.9 ab
	Orthene TTO	8 oz/100 gal	39.1 ± 5.0	49.1 ± 10.7	47.7 ± 5.6	49.3 ± 5.7	54.5 ± 9.7 abc
	Safari 2G	60 g/ft ht	31.9 ± 5.1	44.7 ± 2.9	65.1 ± 9.1	62.1 ± 3.3	69.0 ± 7.0 a
	Safari 20SG	6 g/ft ht	41.5 ± 3.3	45.6 ± 8.7	48.4 ± 13.7	58.5 ± 6.7	60.4 ± 4.9 abc
	Tristar 30SG + Capsil	8 oz + 6 fl oz/100 gal	39.7 ± 2.4	33.3 ± 4.6	60.9 ± 6.0	46.0 ± 5.2	48.8 ± 5.8 bcd
	Nontreated	-	37.5 ± 4.2	42.6 ± 10.4	55.6 ± 12.5	40.6 ± 8.3	49.3 ± 7.0 bcd

* ANOVA for Completely Randomized Design at $\alpha = 0.05$. Means within a column with the same letters are not significantly different among the treatments by LSD.

Table 6. Efficacy on Camellia Scale on Camellia, Chong, SC, 2014.

Treatment	Rate (per 100 gal)	Population Averages (Henderson's Percent Control) ^x				
		Pretreat	7 DAT ^y	14 DAT	28 DAT	6 MAT
<i>Adults</i>						
Distance	12 fl oz	14.0 a	0.2 a (81)	0 c (100)	0.5 b (95)	0.2 d (89)
Kontos	3.4 fl oz	17.0 a	0 a (100)	0.5 bc (74)	0 b (100)	0.3 d (86)
Mainspring*	0.125 fl oz	13.0 a	2.2 a (0)	0.8 abc (46)	10.0 a (0)	3.8 a (0)
Mainspring	0.25 fl oz	12.7 a	0.3 a (68)	0.3 c (79)	10.2 a (0)	1.7 bcd (0)
Paraffin oil	2%	8.2 a	0.3 a (50)	0.2 c (78)	0 b (100)	0 d (100)
Talus 70DF	14 oz	11.8 a	0.2 a (77)	0.3 c (77)	1.3 b (84)	3.2 ab (0)
XXpire**	2 oz	12.2 a	1.0 a (0)	1.8 ab (0)	6.0 ab (30)	0.5 cd (68)
XXpire	2.75 oz	13.7 a	0.2 a (80)	0.2 c (87)	0 b (100)	0 d (100)
XXpire	3.5 oz	13.8 a	0 a (100)	0.2 c (87)	0.5 b (95)	1.3 bcd (28)
Nontreated	-	17.7 a	1.3 a (0)	2.0 a (0)	12.5 a (0)	2.3 abc (0)
<i>Nymphs</i>						
Distance	12 fl oz	13.3 a	0.5 c (98)	0.8 bc (90)	2.5 b (90)	0.3 bc (97)
Kontos	3.4 fl oz	12.5 a	1.7 c (91)	0.5 bc (94)	1.2 b (98)	0.5 d (95)
Mainspring*	0.125 fl oz	12.7 a	7.0 ab (63)	1.3 bc (84)	16.7 a (30)	10.5 a (6)
Mainspring	0.25 fl oz	6.2 a	5.2 bc (44)	0.7 bc (82)	13.5 a (0)	5.3 a (3)
Paraffin oil	2%	6.5 a	1.2 c (88)	0.8 bc (80)	0.5 b (96)	1.0 cd (83)
Talus 70DF	14 oz	16.5 a	0.5 c (98)	0.5 bc (95)	10.3 ab (67)	1.2 cd (92)
XXpire**	2 oz	17.0 a	9.7 ab (62)	2.8 ab (74)	13.7 a (57)	1.7 cd (89)
XXpire	2.75 oz	15.5 a	4.8 bc (79)	1.3 bc (87)	2.0 b (93)	0 d (100)
XXpire	3.5 oz	6.8 a	3.5 bc (66)	0.3 c (93)	0.7 b (95)	2.3 cd (62)
Nontreated	-	8.3 a	12.5 a (0)	5.2 a (0)	15.7 a (0)	7.3 ab (0)
<i>Total</i>						
Distance	12 fl oz	27.3 a	0.7 d (95)	0.8 b (89)	3.0 b (90)	0.5 d (95)
Kontos	3.4 fl oz	29.5 a	1.7 cd (89)	1.0 b (88)	1.2 b (96)	0.8 d (93)
Mainspring*	0.125 fl oz	25.7 a	9.2 abc (33)	2.2 b (69)	27.7 a (1)	14.3 a (0)
Mainspring	0.25 fl oz	18.8 a	5.5 bcd (45)	1.0 b (81)	23.7 a (15)	7.0 bc (0)
Paraffin oil	2%	14.7 a	1.5 cd (81)	1.0 b (75)	0.5 b (97)	1.0 d (82)
Talus 70DF	14 oz	28.3 a	0.7 d (95)	0.8 b (90)	11.7 ab (62)	4.3 bcd (59)
XXpire**	2 oz	29.7 a	10.7 ab (32)	2.2 b (73)	19.7 a (39)	2.2 cd (80)
XXpire	2.75 oz	29.2 a	5.0 bcd (68)	1.5 b (81)	2.0 b (94)	0 d (100)
XXpire	3.5 oz	20.7 a	3.5 bcd (68)	0.5 b (91)	2.5 a (89)	3.7 cd (52)
Nontreated	-	26.0 a	13.8 a (0)	7.2 a (0)	28.2 a (0)	9.7 ab (0)

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

^y DAT = days after the first treatment; MAT = months after first treatment.

* Mainspring applied as drench once at 0.25 fl oz per foot shrub height on Jun 13, and twice at the lower rate on Jun 13 and Jul 11.

** Capsil (at 6 fl oz/100 gal) was mixed in the solutions of GF-2860.

Cycad Scale

In 2019, Dale evaluated the efficacy of several products applied foliar on cycad scale (*Aulacaspis yasumatsui*) on sago palm (*Cycas revoluta*). Overall, the top-performing products were Ventigra, Altus and Talus (Table 7). Ventigra and Talus clearly provided the best control of cycad aulacaspis scale, as reflected in the data and in the visual quality/appearance of the plants. Ventigra- and Talus-treated plants were easily distinguished visually in the greenhouse blocks. Importantly, Ventigra was only applied once, while Talus and Altus were applied twice. All other products were applied more frequently but still provided little control. Despite the statistical differences, scale numbers on plants treated by the most effective products were still potentially damaging, especially towards the end of the trial almost 3 months after initial applications. Subsequent applications of products like horticultural oils and/or mechanical removal of infested plant tissue (pruning) would provide more effective and integrated control of this scale insect. No phytotoxic effects were observed for the duration of the trial.

Elongate Hemlock and Cryptomeria Scales

In 2005 and 2008, Cowles conducted two experiments for control of both elongate hemlock scale (*Fiorinia externa*) and Cryptomeria scale (*Aspidiotus cryptomeriae*) on Fraser Fir (*Abies fraseri*). In 2005, Flagship 25WP, Safari 20SG, Talus 40SC, and TriStar 70WSP provided excellent control at all tested rates (Table 8). Cygon 267 and Onyx also performed well. Another product providing good efficacy was Esteem 35WP. Lesco Oil provided poor control except when paired with Silwet L-77. In 2008, Safari trunk spray was the only treatment that provided good control, better than the standard Onyx foliar spray (Table 9). Safari also has minimal impact on natural enemies that may make this treatment a preferable approach for scale management.

Table 7. Efficacy on Cycad Scale (*Aulacaspis yasumatsui*) on Sago Palm (*Cycas revoluta*), Dale, 2019.

Treatment	Rate	Pretreat	7 DAIT	14 DAIT	21 DAIT	28 DAIT	77 DAIT
Number of aulacaspis scale adults per cm of leaflet length^x							
Altus (flupyradifurone)	14 fl oz	0.1 b	0.3 (29)	0.9 (0)	1.6 abc (0)	1.0 b (0)	1.4 abc (0)
Azaguard (azadirachtin)	16 fl oz	0.1 b	0.2 (52)	0.9 (0)	2.2 ab (0)	1.8 ab (0)	1.9 abc (0)
KOC22018-8 (botanical oil blend)	128 fl oz	0.4 ab	0.1 (94)	-	2.1 ab (0)	1.8 ab (34)	2.5 ab (8)
Pradia SL (cyclaniliprole + flonicamid)	16.5 fl oz	0.2 ab	0.2 (76)	0.7 (0)	3.3 a (0)	3.0 a (0)	3.1 a (0)
Sarisa (cyclaniliprole)	28 fl oz	0.4 ab	0.1 (94)	-	3.0 a (0)	3.3 a (0)	3.2 a (0)
Talus 70DF (buprofezin)	14 oz	0.2 ab	0.1 (88)	0.1 (85)	0.1 c (90)	0.1 c (93)	1.0 bc (26)
TetraCURB Conc (rosemary oil)	128 fl oz	1.0 a	1.4 (67)	1.4 (59)	2.0 abc (60)	1.5 ab (78)	1.8 abc (74)
TetraCURB Org (rosemary oil)	128 fl oz	0.2 ab	0.1 (88)	0.8 (0)	2.0 abc (0)	2.0 ab (0)	3.8 a (0)
Ventigra (afidopyropen)	7 fl oz	0.0 b	0.1 (nc)	0.6 (nc)	0.7 bc (nc)	0.8 bc (nc)	0.6 c (nc)
Nontreated	-	0.5 ab	2.1 (0)	1.7 (0)	2.5 ab (0)	3.4 a (0)	3.4 a (0)
Number of aulacaspis scale nymphs per cm of leaflet length^x							
Altus (flupyradifurone)	14 fl oz	7.3 ab	5.3 abc (24)	3.0 (0)	1.9 ab (0)	2.1 b (81)	7.2 (18)
Azaguard (azadirachtin)	16 fl oz	11.9 a	8.2 a (28)	5.0 (0)	3.9 a (0)	11.2 a (37)	6.4 (55)
KOC22018-8 (botanical oil blend)	128 fl oz	6.2 ab	6.5 ab (0)	-	2.1 ab (0)	6.1 ab (34)	4.7 (37)
Pradia SL (cyclaniliprole + flonicamid)	16.5 fl oz	9.0 ab	3.6 abc (58)	3.3 (4)	1.0 ab (22)	5.4 ab (60)	4.5 (59)
Sarisa (cyclaniliprole)	28 fl oz	7.5 ab	7.5 ab (0)	-	2.1 ab (0)	9.6 a (14)	8.4 (7)
Talus 70DF (buprofezin)	14 oz	7.5 ab	2.9 bc (59)	6.2 (0)	1.5 ab (0)	3.7 ab (67)	4.6 (49)
TetraCURB Conc (rosemary oil)	128 fl oz	4.7 b	3.2 bc (29)	2.3 (0)	0.7 ab (0)	5.8 ab (17)	6.0 (0)
TetraCURB Org (rosemary oil)	128 fl oz	8.1 ab	6.4 ab (17)	3.1 (0)	0.6 ab (48)	7.1 a (41)	4.5 (54)
Ventigra (afidopyropen)	7 fl oz	6.9 ab	0.8 c (88)	2.9 (0)	0.1 b (90)	1.3 b (87)	3.1 (63)
Nontreated	-	6.3 ab	6.0 abc (0)	2.4 (0)	0.9 ab (0)	9.4 a (0)	7.6 (0)
Number of aulacaspis scale crawlers per cm of leaflet length^x							
Altus (flupyradifurone)	14 fl oz	0.4 ab	0.1 (0)	0.0 (nc)	0.0 (100)	0.9 (6)	1.1 (0)
Azaguard (azadirachtin)	16 fl oz	1.9 ab	0.2 (0)	0.1 (nc)	0.7 (39)	1.4 (69)	1.4 (57)
KOC22018-8 (botanical oil blend)	128 fl oz	1.4 ab	0.0 (100)	-	0.1 (88)	1.7 (49)	2.3 (3)
Pradia SL (cyclaniliprole + flonicamid)	16.5 fl oz	2.1 a	0.0 (100)	0.0 (nc)	0.2 (84)	3.4 (33)	1.4 (61)
Sarisa (cyclaniliprole)	28 fl oz	1.5 ab	0.0 (100)	-	0.6 (33)	3.4 (6)	2.6 (0)
Talus 70DF (buprofezin)	14 oz	1.8 ab	0.0 (100)	0.1 (nc)	0.6 (44)	0.3 (93)	3.4 (0)
TetraCURB Conc (rosemary oil)	128 fl oz	1.7 ab	0.3 (0)	0.0 (nc)	0.2 (80)	2.4 (41)	1.8 (38)
TetraCURB Org (rosemary oil)	128 fl oz	0.4 ab	0.0 (100)	0.1 (nc)	0.1 (58)	3.7 (0)	3.6 (0)
Ventigra (afidopyropen)	7 fl oz	0.3 b	0.0 (100)	0.0 (nc)	0.2 (0)	1.5 (0)	0.8 (0)
Nontreated	-	1.0 ab	0.1 (0)	0.0 (nc)	0.6 (0)	2.4 (0)	1.7 (0)

^x Means within a column followed by same letter do not significantly differ (Tukey HSD test, P=0.05). When treatment did not have a significant effect on number of scale, no letters follow the means for that evaluation

Table 8. Efficacy on Elongate Hemlock Scale and Cryptomeria Scale on Fraser Fir, Cowles, CT, 2005.

Treatment	Rate (No. of applications)	Live per 1000 needles	Percent Control
Admire 2F - Drench	0.5 lb/Acre, drench	3080 ab	63
Cygon 267	32 fl oz/100 gal (2)	507 b-f	94
Cygon 267 - Drench	60 ml/tree, drench	313 efg	96
Esteem 35WP	2.5 oz/100 gal (2)	800 b-f	90
Flagship 25WP	2.0 oz/100 gal (2)	273 c-f	97
Flagship 25WP	4.0 oz/100 gal (2)	240 b-f	97
Lesco Oil	1%	3280 ab	60
Lesco Oil	2%	5270 a	36
Lesco Oil + Silwet L-77	2% + 4 fl oz/100 gal	2244 abc	73
Lorsban 75WDG	0.66 lb/100 gal (2)	1320 a-d	84
Onyx	2.6 oz/100 gal	452 b-e	94
Onyx + Lesco Oil	2.6 oz/100 gal + 1%	1160 a-d	86
Safari 20SG	4.0 oz/100 gal (2)	453 b-f	94
Safari 20SG	8.0 oz/100 gal (2)	49.1 fgh	99
Safari 20SG – Drench	3 g/ft of tree height	12.4 gh	100
Safari 20SG – Drench	6 g/ft of tree height	0.0 h	100
Talus 40SC	21.5 fl oz/100 gal (2)	348 b-f	96
TriStar 70WSP	48 g/100 gal (2)	225 def	97
TriStar 70WSP	96 g/100 gal (2)	554 fgh	93
Nontreated check	-	8220 a	-

* Letters after numbers are based on separation of average number of scale on 4 plants. See experiment report in Appendix 3 for statistical separation details.

Table 9. Efficacy on Elongate Hemlock Scale and Cryptomeria Scale and its Parasite *Encarsia citrina* on Fraser Fir, Cowles, CT, 2008.

Treatment	Rate per acre	Application Method, Timing	# Scales per 100 needles	Percent Control	Percent Parasitism
BotaniGard ES (<i>Beauveria bassiana</i>)	64 fl oz	Foliar, June 3	1530 a	0	15.5 a
BotaniGard ES (<i>Beauveria bassiana</i>) + Prev-Am	64 fl oz	Foliar, June 3	1230 abc	0	8.5 bcde
Movento 240SC 240(spirotetramat) + MSO	5 fl oz	Foliar, May 19	1470 ab	0	14.3 ab
Movento 240SC 240(spirotetramat) + MSO	10 fl oz	Foliar, May 19	742 def	7	13.2 ab
Movento 240SC (spirotetramat) + MSO	5 fl oz	Foliar, June 3	1090 bcd	0	14.5 ab
Movento 240SC (spirotetramat) + MSO	10 fl oz	Foliar, June 3	857 cde	0	10.9 abcd
Onyx Pro (bifenthrin)	6.4 fl oz	Foliar, June 3	279 _g	65	2.5 e
Safari 20SG (dinotefuran)	0.68 lb	Soil, June 3	528 efg	34	7.2 cde
Safari 20SG (dinotefuran)	1.35 lb	Soil, June 3	810 cde	0	9.6 abcd
Safari 20SG (dinotefuran)	2.7 lb	Soil, June 3	328 fg	59	8.9 abcde
Safari 20SG (dinotefuran)	0.68 lb	Trunk spray, June 3	106 _g	87	5.6 de
Safari 20SG (dinotefuran)	1.35 lb	Trunk spray, June 3	114 _g	86	7.6 cde
Safari 20SG (dinotefuran)	2.7 lb	Trunk spray, June 3	194 _g	76	5.3 de
Nontreated	-	-	796 de	-	11.8 abcd

* Means followed by the same letter in the same column are not significantly different, for non-transformed data(LSD test, $P < 0.05$).

Euonymus Scale

From 2004 through 2014, several researchers have examined insecticide efficacy for euonymus scale. In general, neonicotinoids tended to provide good control, as did Distance; variable control was obtained with Talus, A16901B and XXpire.

Nielsen. In 2007 and 2009, Nielsen investigated the efficacy of neonicotinoids (Flagship, Safari and TriStar), insect growth regulators (Distance and Talus) and Rycar (pyrifluquinazon) on euonymus scale (*Unaspis euonymi*) infesting euonymus (*Euonymus vegetus*) ‘Fortunei’ in the landscape.

In the 2007 experiment comparing drench and trunk spray applications of Safari, only the spray treatment controlled first generation nymphs at 34 DAT (Table 10). The drench application looked somewhat successful on the second generation nymphs at 89 DAT. The early spray treatment was beginning to fail at that time, indicating that two spray applications might be required to “clean-up” scale-infested euonymus in the landscape.

In the 2009 experiment on container plants, foliar sprays of Distance, Talus and UltraFine oil, and Safari drench provided a high level of scale control. TriStar looked promising, but Flagship, Rycar and Safari top-dress were relatively ineffective. These results were mostly reflected when evaluating treatment effects on second generation production of new adults in mid-September. At this time, TriStar looked ineffective.

No phytotoxicity was observed in either experiment.

Table 10. Efficacy on Euonymus Scale on Euonymus ‘Fortunei’, Nielsen, OH, 2007.

Treatment	Rate	Application Method, Timing	Percent Nymphs Dead	
			34 DAT	89 DAT
Safari 20SG (dinotefuran)	24 oz/100gal	Trunk spray, May 3	98	84
Safari 20SG (dinotefuran)	6 g/ ft height	Drench, May 3	3	80
Safari 20SG (dinotefuran)	6 g/ ft height	Drench, May 30	9	44
Nontreated	-	-	6	4

Table 11. Efficacy on Euonymus Scale on Euonymus ‘Sunspot’, Nielsen, OH, 2009.

Treatment	Rate	Application Method, Timing	% Nymph Mortality 15 DAT (6/27/09)	# Live adult scales 91 DAT (9/11/09)
Distance 10EC (pyriproxyfen)	12 fl oz/100 gal	Foliar, June 12, 26	99	0
Flagship 0.22G (thiamethoxam)	114 g/ft. ht	Top-dress, June 26	-	100+
Flagship 25WG (thiamethoxam)	8 oz/100gal	Foliar, June 12, 26	63	75
Rycar 20SC (pyrifluquinazon)	12 fl oz/100 gal	Foliar, June 12, 26	49	100+
Safari 2G (dinotefuran)	60 g/ft. ht	Top-dress, June 12	71	38
Safari 20SG (dinotefuran)	6 g/ft. ht	Drench, June 12	91	3
Talus 40 SC (buprofezin)	21.5 fl oz/100 gal	Foliar, June 12, 26	92	0
TriStar 30 SG (acetamiprid)	8 oz/100 gal	Foliar, June 12, 26	88	91
UltraFine Oil	3 % solution	Foliar, June 12, 26	90	0
Nontreated	-	-	15	100+

Frank. In 2009 and 2010, Frank evaluated the efficacy of neonicotinoids (Flagship, Safari and TriStar),insect growth regulators (Distance and Talus), A16901B, Kontos,Rycarand Talstar on euonymus scale (*Unaspis euonymi*) infesting spindle tree (*Euonymus japonica*) ‘Mycrophylla’. All treatments significantly reduced scale population, comparable to the standard Acephate and Horticultural oil (Table 12,Table 13).

No phytotoxicity was observed on any of the treated plants.

Table 12. Efficacy on Euonymus Scale on Spindle Tree ‘Microphylla’, Frank, NC, 2009.

Treatment	Rate	Application Method	Population Averages (Henderson’s Percent Control)				
			Pretreatment Counts	1 WAT	2 WAT	4 WAT	6 WAT
Acephate 75WP	0.67 lb/100 gal	Foliar	151.2 a	68.0 c (45)	4.3 d (67)	2.5 c (18)	0.5 b (56)
Distance 10EC (pyriproxyfen)	12 fl oz/100 gal	Foliar	102.3 a	50.8 c (40)	5.7 d (41)	0.5 c (88)	0.2 b (11)
Flagship 0.22G (thiamethoxam)	60 g/plant	Broadcast	203.7 a	108.0 bc (36)	32.0 abc (0)	18.0 b (20)	3.7 b (54)
Flagship 25WG (thiamethoxam) + Dyne-Amic	8 oz/100gal	Foliar	184.5 a	103.0 bc (32)	12.3 cd (37)	0.5 c (94)	1.3 b (0)
Rycar20SC (pyrifluquinazon)	18 fl oz/100 gal	Foliar	265.2 a	160.2 ab (27)	9.5 cd (69)	1.3 c (81)	1.2 b (0)
Safari 2G (dinotefuran)	7.8 g/plant	Broadcast	213.0 a	129.7 bc (26)	39.7 ab (0)	5.0 c (82)	1.2 b (47)
Safari 20SG (dinotefuran)	24 oz/100gal	Drench	166.7 a	167.0 ab (0)	3.2 d (90)	1.0 c (56)	0.5 b (0)
Talus 40 SC (buprofezin)	21.5 fl oz/100 gal	Foliar	204.3 a	65.0 c (68)	4.7 d (62)	2.7 c (19)	0.2 b (32)
TriStar 30 SG (acetamiprid) + Capsil	8 oz/100 gal + 6 fl oz/100 gal	Foliar	158.3 a	111.5 bc (14)	17.3 bcd (18)	4.2 c (66)	2.5 b (0)
Nontreated	-	-	265.5 a	218.3 a (0)	41.5 a (0)	29.3 a (0)	13.2 a (0)

* Means followed by same letter do not significantly differ (Duncan's New MRT, P=0.05)

Table 13. Efficacy on Euonymus Scale on Spindle Tree ‘Microphylla’, Frank, NC, 2010.

Treatment	Rate	Application Method	Population Averages (Henderson’s Percent Control)				
			Pretreat	1 WAT	2 WAT	4 WAT	6 WAT
A16901B	5 oz/100 gal	Drench	221.5 a	65.8 a (61)	9.0 b (95)	6.2 b (97)	6.2 b (95)
Distance 10EC (pyriproxyfen)	12 fl oz/100 gal	Foliar	242.0 a	122.7 a (33)	76.8 b (59)	33.5 b (87)	9.0 b (93)
Flagship 0.22G (thiamethoxam)	60 g/plant	Broadcast	202.5 a	64.2 a (58)	39.5 b (75)	14.0 b (94)	4.8 b(96)
Flagship 25WG (thiamethoxam) + Dyne-Amic	8 oz/100gal	Foliar	225.3 a	102.0 a (41)	43.7 b (75)	22.5 b (91)	2.8 b (98)
Horticultural Oil	5 qt/100 gal	Foliar	135.0 a	48.3 a (53)	8.2 b (92)	3.0 b (98)	1.0 b(99)
Kontos (spirotetramat)	3.4 fl oz/100gal	Foliar	234.7 a	68.7 a (62)	24.3 b (87)	7.8 b (97)	0.5 b (100)
Rycar 20SC (pyrifluquinazon)	18 fl oz/100 gal	Foliar	229.7 a	109.3 a (38)	46.8 b (74)	3.2 b (99)	0.0 b (100)
Safari 2G (dinotefuran)	7.8 g/plant	Broadcast	172.7 a	86.7 a (34)	33.8 b (75)	7.0 b (96)	1.0 b (99)
Safari 20SG (dinotefuran)	24 oz/100gal	Drench	206.8 a	109.3 a (31)	41.8 b (74)	7.2 b (97)	2.2 b (98)
Talstar (bifenthrin)	21.7 oz/100 gal	Foliar	166.3 a	122.3 a (3)	41.8 b (68)	4.7 b (97)	1.0 b (99)
Talus70 DF (buprofezin)	14 oz/100 gal	Foliar	199.2 a	55.7 a (63)	50.3 b (68)	2.7 b (99)	0.8 b (99)
TriStar 30 SG (acetamiprid) + DyneAmic	8 oz/100 gal	Foliar	184.3 a	95.3 a (32)	32.3 b (78)	6.8 b (97)	1.8 b (98)
Nontreated	-	-	238.0 a (0)	181.3 a (0)	186.3 a (0)	261.8 a (0)	127.0 a (0)

* Means followed by same letter do not significantly differ (Duncan's New MRT, P=0.05).

Ludwig. In 2009, Ludwig evaluated the efficacy of neonicotinoids (Aloft, Flagship, Safari and TriStar), insect growth regulators (Distance and Talus) and Triact (neem oil extract) on euonymus scale (*Unaspis euonymi*) infesting spindle tree (*Euonymus japonica*) ‘Mycrophylla’. All treatments provided significantly higher scale mortality 57 days after the first application (Table 14). Safari was the best, and Tristar the least effective treatment.

Table 14. Efficacy on Euonymus Scale on Spindle Tree ‘Microphylla’, Ludwig, TX, 2009.

Treatment	Rate	Application Method	Percent Female Adult Scale Mortality		
			Pretreatment	29 DAT	57 DAT
Aloft SC	5 fl oz/100 gal	Foliar	23.3a	94.0a	77.3ab
Aloft SC	10 fl oz/100 gal	Foliar	32.7a	82.7abc	97.3ab
Distance 10EC (pyriproxyfen)	12 fl oz	Foliar	38.7a	46.7cde	92.8ab
Flagship 25WG (thiamethoxam)	8 oz/100gal	Foliar	26.7a	68.0abcd	80.1ab
Safari 2G (dinotefuran)	2.6 g / gallon of media	Media mix	34.7a	96.0a	99.2a
Safari 20SG (dinotefuran)	24 oz/100gal	Drench	18.7a	66.4abcd	99.3a
Talus 40 SC (buprofezin)	21.5 fl oz/100 gal	Foliar	21.3a	29.3de	82.7ab
Triact 70 (neem oil extract)	2 gal/100 gal	Foliar	29.6a	91.3ab	90.0ab
TriStar 30 SG (acetamiprid)	8 oz/100 gal + 6 fl oz/100 gal	Foliar	30.0 a	57.3 bcde	62.0 b
Nontreated	-	-	25.3 a	17.3 e	12.0 c

* Means within a column followed by the same letter are not significantly different (Tukey’s HSD, P< 0.05).

Potter. In 2010, Potter evaluated the efficacy of neonicotinoids (Flagship, Safari and TriStar), insect growth regulators (Distance and Talus), A16901B, Kontos and Rycar on euonymus scale (*Unaspis euonymi*) infesting spindle tree (*Euonymus japonica*) ‘Moonshadow’. Distance, Safari and Talus provided good control while A16901B, Flagship, Kontos, Rycar, Tristar and the standard Horticultural Oil performed poorly (Table 15). No phytotoxicity was observed on any of the treated plants.

Kunkel. In 2011, Kunkel evaluated the efficacy of neonicotinoids (Flagship, Safari and TriStar), insect growth regulators (Distance and Talus), QRD 452 and Rycar on euonymus scale (*Unaspis euonymi*) infesting wintercreeper (*Euonymus fortunei*) ‘Radicans’. Safari and Talus provided good control while Distance, Horticultural Oil, QRD 452 and Tristar were generally inferior (Table 16). No phytotoxicity or growth reduction was observed on any of the treated plants.

Table 15. Efficacy on Euonymus Scale on Spindle Tree ‘Moonshadow’, Potter, KY, 2010.

Treatment	Rate (per 100 gal)	Application Method, Timing	No. Live Scales, 1 st Generation (% Control)	No. Live Scales, 2 nd Generation (% Control)
A16901B	5 oz	Drench, May 10	16.8 ± 3.7 e (0)	20.5 ± 4.3 d (0)
Distance 10EC (pyriproxyfen)	12 fl oz	Foliar, May 10, June 1	1.1 ± 0.5 ab (84)	2.8 ± 1.3 a (59)
Flagship 0.22G broadcast	40 g/2 gal pot	Media mix, May 10	5.6 ± 1.5 cd (20)	9.4 ± 2.3 bc (0)
Flagship 25WG + spreader-sticker	8 oz	Foliar, May 10, June 1	5.4 ± 1.6 bcd (23)	13.3 ± 2.5 c (0)
Horticultural Oil	2 gal	Foliar, May 10	3.7 ± 0.9 a-d (47)	9.4 ± 2.4 bc (0)
Kontos (spirotetramat)	3.4 fl oz	Foliar, May 10	7.7 ± 2.8 d (0)	6.3 ± 1.4 ab (7)
Rycar 20SC (pyrifluquinazon)	18 fl oz	Foliar, May 24	2.1 ± 0.9 abc (70)	9.9 ± 2.5 bc (0)
Safari 20SG (dinotefuran)	24 oz	Drench, May 10	0.2 ± 0.1 a (97)	0.7 ± 0.3 a (90)
Talus 40 SC (buprofezin)	21.5 fl oz	Foliar, May 10	0.3 ± 0.1 a (96)	1.0 ± 0.6 a (85)
TriStar 30 SG (acetamiprid)	8 oz	Foliar, May 10, 24	2.2 ± 0.7 abc (69)	4.8 ± 1.3 ab (29)
Nontreated	-	-	7.0 ± 1.7 d (0)	6.8 ± 2.4 ab (0)

* Means within a column followed by the same letter are not significantly different (LSD All-Pairwise Comparisons Test). First and 2nd generation scales counted June 21-22 and October 4-7, respectively.

Table 16. Efficacy on Euonymus Scale on Wintercreeper, (*Euonymus fortunei*) ‘Radicans’, Kunkel, DE, 2011.

Treatment	Rate (per 100 gal)	Average % Mortality ^x				
		Pretreat	7 DAT	14 DAT	28 DAT	42 DAT
Distance 10EC	12 fl oz	6.6 a	30.4 a	30.3 ab	72.4 ab	73.5 bc
Flagship 25WG + Capsil	8 oz	10.3 a	46.6 a	27.7 ab	46.5 cd	64.7 cd
Flagship 0.22G broadcast	20 g/1 gal pot	8.4 a	30.1 a	55.4 a	60.2 abc	65.4 cd
Horticultural Oil	1 gal	11.1 a	33.0 a	46.7 ab	69.7 abc	71.7 bc
Rycar 20SC	18 fl oz	7.7 a	30.0 a	43.3 ab	51.8 bcd	56.3 cd
QRD 452	128 oz	4.3 a	42.0 a	31.1 ab	58.9 abc	73.0 bc
Safari 20SG drench	24 oz	10.3 a	51.3 a	35.6 ab	72.2 abc	90.0 ab
Talus 40SC	21.5 fl oz	17.5 a	62.3 a	49.6 a	76.5 a	92.0 a
TriStar 30SG + Capsil	8 oz	3.9 a	41.4 a	41.7 ab	47.8 bcd	69.3 bc
Nontreated	-	7.6 a	24.6 a	12.0 b	30.0 d	43.0 d

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

Gilrein. In 2011, Gilrein evaluated the efficacy of neonicotinoids (Flagship, Safari and TriStar), insect growth regulators (Distance and Talus), A16901B, Kontos and Rycar on euonymus scale (*Unaspis euonymi*) infesting euonymus (*Euonymus japonicus*) ‘Green Spire’. Talus and Distance were most effective for controlling euonymus scale, followed closely by Kontos (Table 17). No or nearly no live females were found at final observation (Sept. 11) on plants treated with Distance or Talus. TriStar, Safari, Rycar and A16901 all had noticeably lower numbers of females on treated plants than the Nontreated, but differences were not significant; Flagship was ineffective. No differences in plant heights, widths and overall quality were seen among treatments (data not shown). No phytotoxicity was observed in any of the treated plants.

Table 17. Efficacy on Euonymus Scale on Euonymus, (*Euonymus japonicus*) ‘Green Spire’, Gilrein, NY, 2011.

Treatment	Rate Per 100 Gal	Applic. Method, Timing	Population Averages ^x (Percent Control)						
			Crawlers 6/10	Crawlers 7/11	Females 7/11	Males 7/11	Females + Males 7/11	All Stages 7/11	Females 9/19
A16901B 40WG	5 oz	Drench, 6/15	135.6 a	36.2a (0)	115.6a (0)	18.4ab (0)	134.0a (0)	170.0a (0)	22.4ab (53)
Distance 0.86EC	12fl oz	Spray, 6/15, 7/6	147.0 a	16.6 ab (0)	16.8 cd (71)	0.6 c (81)	17.4 cd (71)	34.0 b (55)	0.4 cd (99)
Flagship 25WG	0.5 g/ft ht	Drench, 6/15	128.2 a	48.4a (0)	77.0ab (0)	61.8a (0)	138.8a (0)	187.2a (0)	53.4a (0)
Kontos 2F	3.4 fl oz	Spray, 6/15	128.6 a	6.2 b (59)	23.2 bc (60)	26.6 bc (0)	32.8 b (46)	7.8 bc (90)	26.6 bc (44)
Rycar 1.80SC	18 fl oz	Spray, 6/15	144.2 a	13.0 ab (14)	51.4 abc (10)	3.8 bc (0)	55.2 abc (9)	68.2 ab (10)	12.4 ab (74)
Safari 20SG	24 oz	Drench, 6/15	153.0 a	54.6 a (0)	33.2 abc (42)	46.6 a (0)	79.8 ab (0)	134.4 a (0)	17.8 ab (62)
Talus 70DF	14 oz	Spray, 6/15	131.6 a	3.2 b (80)	5.6 d (90)	0.2 c (94)	5.8 d (90)	9.0 c (88)	0.0 d (100)
TriStar 30SG + Capsil	8 oz + 6 fl oz	Spray, 6/15, 6/29	141.6 a	33.2 a (0)	49.6 abc (14)	9.4 abc (0)	59.0 abc (3)	92.2 ab (0)	17.6 ab (63)
Nontreated	water	Spray, 6/15	133.8 a	15.2 ab (0)	57.4 abc (0)	3.2 bc (0)	60.6 abc (0)	75.8 ab (0)	47.2 a (0)

^xMeans within columns followed by the same letter are not significantly different at p=0.05 (LSMeans Tukey’s HSD).

Braman. In 2014, Braman evaluated the efficacy of various insecticides applied as foliar sprays on May 14 and 28 for euonymus scale (*Unaspis euonymi*) infesting euonymus in containers. All treatments provided excellent control of nymphs within 2 weeks after treatment and through 6 months for adults (Table 18).

Table 18. Efficacy on Euonymus Scale on Euonymus, Braman, GA, 2014.

Treatment	Rate Per 100 Gal	Population Averages ^x (Percent Control)				
		Nymphs			Adults	
		Day 0	Day 7	Day 14	4 Months	6 Months
Distance	12 floz	14.2 a	3.2 a (98)	3.2 ab (99)	0.0 b	0.0 b (100)
Horticultural Oil	2 gal	0.7 b	5.3 a (29)	0.5 b (96)	0.0 b	0.0 b (100)
Mainspring 200SC	8 floz	7.3 ab	14.5 a (81)	0.2 b (99)	0.3 b	2.7 b (99)
	12 floz	0.8 b	0.8 a (91)	0.3 b (98)	0.0 b	0.0 b (100)
Orthene TTO 97	8 oz	1.7 b	3.2 a (82)	0.8 b (97)	0.0 b	0.0 b (100)
Safari 20SG	24 oz	7.0 ab	18.7 a (75)	1.5 ab (99)	0.0 b	0.0 b (100)
Talus 70DF	14 oz	0.2 b	1.0 a (53)	0.0 b (100)	0.0 b	0.0 b (100)
XXpire 40WG + Capsil	2 oz + 6 floz	0.7 b	0.3 a (96)	0.0 b (100)	0.0 b	0.0 b (100)
	2.75 oz + 6 floz	14.7 a	0.8 a (99)	0.0 b (100)	0.0 b	0.0 b (100)
	3.5 oz + 6 floz	0.2 b	2.5 a (0)	0.5 b (84)	0.0 b	0.0 b (100)
Nontreated	-	0.3 b	3.2 a (0)	4.8 a (0)	0.0 b	9.8 a (0)

^x Number counted from 3 leaves. Means followed by same letter do not significantly differ (LSD, P=0.05).

* Mainspring and Safari applied as drench.

Potter. In 2014, Potter evaluated the efficacy of several insecticides on euonymus scale (*Unaspis euonymi*) infesting potted wintercreeper (*Euonymus fortunei*) ‘Emerald N Gold’. Orthene and XXpire (3.5 oz rate) provided the best control (more than 70%) of scale populations (Table 19). XXpire (2.0 oz rate) and Mainspring (12 oz rate) both significantly reduced scale populations, but to lower degree at 61.0% and 36.4%, respectively. The IGR's Distance and Talus looked ineffective. No phytotoxicity was observed on any of the treated plants.

Table 19. Efficacy on Euonymus Scale on Wintercreeper (*Euonymus fortunei*) ‘Emerald N Gold’, Potter, KY, 2014.

Treatment	Rate (per 100 gal)	Application Method, Timing	Adult Female Scales ^x	Percent Reduction
Distance	12 fl oz	Foliar At crawler stage. Repeat at 3 wks	7.8± 2.6 bc	0%
Mainspring 200SC	8 floz	Soil drench. 30 day prior to hatch. 3 floz per pot.	6.0 ± 1.2 bc	22.1%
	12 floz		4.9± 1.5 ab	36.4%
Orthene	150 fl oz	Foliar At crawler stage. Repeat at 1 wk	2.0± 0.5 a	74.0%
Talus 70DF	14 oz	Foliar At crawler stage.	5.6 ± 1.4 bc	27.3%
XXpire 40WG + Capsil	2 oz + 6 floz	Foliar At crawler stage. Repeat at 2 wks.	3.0± 0.6 ab	61.0%
	2.75 oz + 6 floz		5.9 ± 1.7 bc	23.4%
	3.5 oz + 6 floz		1.9± 0.4 a	75.3%
Nontreated	-	-	7.7 ± 1.5 c	-

^x Number per 10 cm of twig. Means within a column followed by the same letter are not significantly different (LSD All-Pairwise Comparisons Test).

False Florida Red Scale

In 2009, Chong evaluated the efficacy of neonicotinoids (Flagship, Safari and TriStar), insect growth regulators (Distance and Talus) and Rycar (pyrifluquinazon) on false Florida red scale (*Chrysomphalus bifasciculatus*) on Chinese holly (*Ilex cornuta*) 'Carissa'. Insecticide treatments did not significantly reduce the numbers of live scales in the first 2 weeks after the application (Table 20). At 4 and 6 WAT, only Flagship and Safari provided effective control, providing 99% mortality (Table 21).

No phytotoxicity was observed on any of the treated holly shrubs.

Table 20. Efficacy on False Florida Red Scale on Chinese Holly ‘Carissa’, Chong, SC, 2009.

Treatment	Rate	Application Method	Population Averages (Henderson’s Percent Control)				
			Pretreatment Counts	1 WAT	2 WAT	4 WAT	6 WAT
Distance 10EC (pyriproxyfen)	12 fl oz	Foliar	28.9 a	12.4 a (87)	12.9 a (50)	4.5 b(0)	10.7 bc(0)
Flagship 25 WG (thiamethoxam)	4 g/ft height	Drench	33.3 a	24.2 a (78)	84.6 a (0)	14.3 ab(46)	1.1 c(94)
Rycar20SC (pyrifluquinazon)	18 fl oz/100 gal	Foliar	49.5 a	24.6 a (85)	14.2 a (72)	12.3 ab(0)	21.0 abc (0)
Paraffinic oil	2 gal/100 gal	Foliar	49.6 a	44.7 a (73)	47.8 a (49)	14.0 ab(7)	17.6 abc(7)
Safari 20SG (dinotefuran)	6 g/ft height	Drench	11.1 a	16.8 a (55)	24.3 a (31)	2.2 b(71)	0.2 c(93)
Talus 40 SC (buprofezin)	21.5 fl oz/100 gal	Foliar	58.1 a	47.8 a (75)	44.6 a (56)	36.3 a(0)	30.4 ab (38)
TriStar 30 SG (acetamiprid) + Capsil	8 oz/100 gal + 6 fl oz/100 gal	Foliar	41.2 a	50.3 a (63)	30.3 a (71)	15.3 ab(0)	11.6 abc(44)
Nontreated	-	-	14.5 a	48.5 a (0)	101.8 a (0)	32.1 a(0)	43.3 a(0)

* Means within columns with the same letter are not significantly different (LSD test, $P < 0.10$).

Table 21. Efficacy on False Florida Red Scale on Chinese Holly, ‘Carissa’, Chong, SC, 2009.

Treatment	Rate	Application Method	Average % Mortality				
			Pretreatment	1 WAT	2 WAT	4 WAT	6 WAT
Distance 10EC (pyriproxyfen)	12 fl oz	Foliar	85.9 a	90.8 a	93.8 a	96.8 a	95.1 ab
Flagship 25WG (thiamethoxam)	4 g/ft height	Drench	72.6 a	80.5 a	81.0 a	90.6 abc	99.4 a
Rycar20SC (pyrifluquinazon)	18 fl oz/100 gal	Foliar	73.5 a	84.6 a	89.8 a	93.3 abc	90.9 bc
Paraffinic oil	2 gal/100 gal	Foliar	67.5 a	83.9 a	79.4 a	94.0 abc	89.3 bc
Safari 20SG (dinotefuran)	6 g/ft height	Drench	85.8 a	89.6 a	91.8 a	98.5 a	99.9 a
Talus 40SC (buprofezin)	21.5 fl oz/100 gal	Foliar	71.3 a	80.0 a	76.4 a	82.1 bc	88.6 bc
TriStar 30SG (acetamiprid) + Capsil	8 oz/100 gal + 6 fl oz/100 gal	Foliar	62.3 a	71.9 a	81.3 a	90.0 abc	90.6 bc
Nontreated	-	-	86.7 a	80.9 a	73.3 a	75.8 c	80.3 c

* Means within columns with the same letter are not significantly different (LSD test, $P < 0.10$).

False Oleander Scale.

In 2004, Ludwig investigated efficacy of Flagship, Safari, Talus and TriStar on false oleander scale (*Pseudaulacaspis cockerelli*) on aucuba (*Aucuba japonica*). None of the treatments provided statistically or biologically significant mortality on this scale species at 13 or 27 days after treatment (Table 22).

Table 22. Efficacy on False Oleander Scale on Aucuba, Ludwig, TX, 2004.

Treatment	Rate (per 100 gal)	Population Averages (Henderson's Percent Control)		
		Pretreatment	13 DAT	27 DAT
Flagship 25WG + NIS	2 oz	65.0 a	230.3 a (8)	55.5 a (28)
Flagship 25WG + NIS	4 oz	54.0 a	197.3 a (5)	44.3 a (0)
Flagship 25WG+ NIS	8 oz	68.8 a	181.3 a (32)	65.5 a (0)
Safari 20SG – Drench	12 oz	61.8 a	166.3 a (30)	43.0 a (23)
Safari 20SG – Drench	24 oz	55.0 a	172.3 a (19)	68.0 a (0)
Safari 20SG – Drench	48 oz	78.5 a	118.8 a (61)	56.8 a (0)
Talus 40SC+ NIS	21.5 fl oz	52.0 a	187.5 a (6)	62.5 a (1)
Talus 40SC+ NIS	43 fl oz	73.3 a	179.3 a (36)	53.3 a (11)
Talus 40SC+ NIS	86 fl oz	73.3 a	173.5 a (39)	50.0 a (14)
Tristar 30SG + NIS	32 g	71.5 a	192.0 a (30)	63.0 a (2)
Tristar 30SG + NIS	64 g	59.8 a	141.0 a (39)	30.8 a (35)
Tristar 30SG + NIS	128 g	79.0 a	261.3 a (14)	70.5 a (20)
Nontreated	-	43.0 a	165.5 a (0)	55.5 a (0)

* Means within columns with the same letter are not significantly different (LSD test, $P < 0.05$).

In 2010, Chong conducted two experiments to evaluate the efficacy of neonicotinoids (Arena, Flagship, Safari and TriStar), insect growth regulators (Distance and Talus), A16901B, Kontos and Rycar on false oleander scale (*Pseudaulacaspis cockerelli*) on Southern magnolia (Table 23 and Table 24). In the first experiment, only the soil drench with Safari achieved 90% mortality in the scale insect population by 6 WAT. By 4 months after treatment, Arena drench, Flagship drench, and Safari broadcast and drench applications provided significant increase in scale mortality. A16901B, Kontos, Orthene and Tristar were ineffective. In the second experiment, Distance, Talus and paraffinic oil provided significantly higher mortality (30.8-50.2%) than the Nontreated check (2.5%) by 2 WAT. Rycar looked ineffective.

In 2012, Braman conducted a field experiment to determine efficacy of neonicotinoids (Arena, Flagship and Safari), insect growth regulators (Distance and Talus), A16901B, GF-2626 and GF-2860 on false oleander scale on Southern magnolia (Table 25). In general, all treatments provided good to excellent control of immatures, comparable to the standard Orthene at 7 days post-treatment. At 28 DAT, A16901B, GF-2626, GF-4860, Arena, Flagship and Safari provided better control of immatures compared to Orthene. Five months after initial treatment, A16901B, Arena, Flagship, GF-2626 at the high rate and Safari were still showing significant suppression of egg production.

No phytotoxicity was observed from any treatment.

In 2014, Chen conducted an experiment examining efficacy on magnolia white scale (*Pseudaulacaspis cockerelli*) on Southern magnolia (*M. grandiflora*) 'Little Gem'. All treatments, except AzaGuard and the lowest rate of XXpire, provided 100 % control of a moderate infestation within 30-60 days after the second application (Table 26).

In 2014, Chong conducted an experiment to evaluate the efficacy of GF-2860/XXpire on false oleander scale (*Pseudaulacaspis cockerelli*) on Southern magnolia (Table 27). Both GF-2860 and the standard paraffin oil provided good control of adults and immatures throughout the growing season, resulting in significantly lower numbers of live false oleander scales. No phytotoxicity or residue of the insecticides was observed during the course of this experiment.

In 2018 and 2019, Held conducted two experiments to evaluate the efficacy of various products applied as foliar sprays against false oleander scale on potted *Aucuba japonica*. In 2018, all treatments, including the standards (Distance, Talus and Tristar), provided poor control, (Table 45, Table 29, Table 30). When examining percent control applying the Henderson's Tilton equation, Sarisa and Ventrigrá provided population suppression between 7 and 28 days after treatment. Talus and Tristar provided suppression starting towards the end of the experiment (6 months after application). Held commented that the application timing might have been too early to provide adequate control of false oleander scale. In 2019, while there were some statistically different reductions between treatments and the nontreated controls up to 28 DAT, only suppression was observed when comparing Henderson's percent control for all life stages with Altus, Azaguard. However, 6 months after treatment, all treatments suppressed populations of all life stages, with Pradia providing 97% efficacy with Altus, Azaguard, and KOC22018 providing good management. No product could reduce the visible appearance of false oleander scale on leaves. The biology of this pest presents unique management challenges.

Table 23. Efficacy on False Oleander Scale on Southern Magnolia, Chong, SC, 2010a.

Treatment	Rate	Applic. Method	Mean Percent Mortality ^x						
			5/20 Pretreat	6/2 1 WAT	6/11 2 WAT	6/24 4 WAT	7/8 6 WAT	9/17 4 MAT	5/31/11 1 YAT
A16901B	10 oz/100 gal	Drench	16.7 ± 2.9	12.7 ± 5.5	15.8 ± 7.8	30.1 ± 13.8	23.2 ± 6.1 cd	28.8 ± 5.9 cde	58.8 ± 4.6 c
Arena 50WDG	4.8 g/in dbh	Drench	15.9 ± 4.9	8.5 ± 4.6	7.0 ± 3.2	26.3 ± 7.9	69.1 ± 12.0 b	73.4 ± 5.6 bc	64.4 ± 12.1 bc
Flagship 0.22G	227 g/in dbh	Broadcast	11.8 ± 2.7	0.3 ± 0.3	11.0 ± 4.3	25.6 ± 9.6	34.9 ± 12.9 cd	47.9 ± 3.4 de	71.5 ± 6.4 bc
	454 g/in dbh		10.2 ± 3.0	13.3 ± 3.7	16.1 ± 5.6	22.8 ± 7.1	38.2 ± 4.3 cd	62.9 ± 4.6 bcde	81.2 ± 8.7 b
Flagship 25WG	4 g/in dbh	Drench	11.8 ± 5.3	3.2 ± 3.2	15.5 ± 7.7	28.8 ± 9.5	38.5 ± 12.1 cd	67.3 ± 5.6 bc	70.5 ± 10.1 bc
Kontos	3.4 fl oz/100gal	Foliar	13.3 ± 3.3	12.8 ± 6.4	16.7 ± 6.4	33.8 ± 7.3	35.0 ± 14.3 cd	51.1 ± 2.6 de	59.6 ± 4.1 c
Orthene 97	8 oz/100gal	Foliar	11.8 ± 4.3	11.3 ± 3.2	19.8 ± 9.6	33.9 ± 12.5	31.8 ± 8.7 cd	43.5 ± 2.6 e	61.0 ± 3.8 c
Safari 2G	60 g/in dbh	Broadcast	11.5 ± 3.5	11.2 ± 5.0	7.2 ± 4.1	44.4 ± 10.1	46.5 ± 11.9 bc	75.1 ± 7.8 b	83.5 ± 6.4 b
Safari 20SG	6 g/in dbh	Drench	24.0 ± 7.2	11.0 ± 3.7	12.7 ± 4.6	44.3 ± 13.4	90.3 ± 34.5 a	87.9 ± 8.0 a	97.6 ± 1.5 a
TriStar 30 SG + Capsil	8 oz/100 gal	Foliar	18.7 ± 6.3	9.0 ± 4.5	12.7 ± 3.5	11.7 ± 6.0	25.9 ± 12.3 cd	49.8 ± 7.6 de	62.8 ± 3.6 c
Nontreated	-	-	12.3 ± 1.7	9.8 ± 4.6	3.3 ± 1.4	34.7 ± 9.9	14.5 ± 7.4 d	41.2 ± 3.8 e	57.1 ± 2.3 c

^x Means followed by same letter do not significantly differ (LSD test, P=0.05). No significant differences from Pretreatment to 4 WAT.

* All treatments applied once on 5/25/10 except Tristar which was applied 5/25/10 and 6/11/10.

Table 24. Efficacy on False Oleander Scale on Southern Magnolia, Chong, SC, 2010b.

Treatment	Rate (per 100 gal)	Mean Percent Mortality ^x				
		Pretreat	1 WAT	2 WAT	4 WAT	6 WAT
Distance 10EC	12 fl oz	17.7 ± 5.0 a	26.4 ± 4.2 a	32.3 ± 4.8 ab	80.4 ± 9.9 a	85.1 ± 2.2 a
Rycar 20SC	18 fl oz	22.0 ± 3.0 a	18.0 ± 1.4 a	17.8 ± 5.8 bc	15.6 ± 4.9 cd	51.1 ± 2.1 b
Paraffinic Oil	2 gal	42.4 ± 16.8 a	28.9 ± 5.3 a	30.8 ± 4.6 b	33.8 ± 10.5 bc	86.8 ± 8.3 a
Talus70 DF	14 oz	19.6 ± 7.2 a	27.2 ± 0.8 a	50.2 ± 11.7 a	57.1 ± 8.4 b	85.2 ± 1.9 a
Nontreated	-	17.5 ± 2.2 a	20.3 ± 3.9 a	2.5 ± 1.6 c	1.7 ± 1.1 d	5.3 ± 2.3 c

^x Means followed by same letter do not significantly differ (LSD test, P=0.05).

* Treatments applied foliar starting on 5/27/10; Distance and Paraffinic oil applied a second time on 6/17/10.

Table 25. Efficacy on False Oleander Scale on Southern Magnolia ‘Little Gem’, Braman, GA, 2012.

Count Date	Treatment	Rate	Application Method	Mean No. Per 2 Leaves (% Control)			
				Adults	Crawlers	Eggs	Nymphs
Pretreat 5/03	A16901B	5 oz/100 gal	Drench	2.0 a	3.2 a	8.8 a	0.0 a
	A16901B	10 oz/100 gal	Drench	2.7 a	10.0 a	5.2 a	0.0 a
	Arena 50WDG	2.4 g/in dbh	Drench	1.2 a	9.2 a	4.0 a	0.0 a
	Distance 10EC	12 fl oz/100 gal	Foliar	1.7 a	21.0 a	5.7 a	0.0 a
	Flagship 0.22G	114 g/ft ht	Broadcast	1.7 a	9.7 a	14.3 a	0.0 a
	Flagship 0.22G	227 g/ft ht	Broadcast	2.5 a	18.0 a	16.0 a	0.0 a
	GF-2626 1SC	8 fl oz/100 gal	Foliar	2.0 a	4.2 a	4.5 a	0.0 a
	GF-2626 1SC	11 fl oz/100 gal	Foliar	1.8 a	8.3 a	3.0 a	0.0 a
	Xxpire 40WG	3.5 oz/100 gal	Foliar	0.8 a	13.0 a	10.5 a	0.0 a
	Xxpire 40WG	7 oz/100 gal	Foliar	1.7 a	5.0 a	5.5 a	0.0 a
	Orthene TTO	10.7 oz/100 gal	Foliar	1.2 a	2.5 a	9.0 a	0.0 a
	Safari 20SG	6 g/in dbh	Drench	0.3 a	10.3 a	0.0 a	0.0 a
	Talus 70DF	14 oz/100 gal	Foliar	1.0 a	3.5 a	2.0 a	0.0 a
Nontreated	-	-	-	1.0 a	13.6 a	14.2 a	0.0 a
7 DAT 5/10	A16901B	5 oz/100 gal	Drench	1.3 a	1.7 bc (95)	6.0 b (76)	1.3 b (89)
	A16901B	10 oz/100 gal	Drench	1.3 a	15.7 b (54)	6.2 b (75)	0.7 b (94)
	Arena 50WDG	2.4 g/in dbh	Drench	1.2 a	0.7 c (98)	4.0 b (84)	0.7 b (94)
	Distance 10EC	12 fl oz/100 gal	Foliar	1.6 a	0.2 c (99)	2.2 b (94)	0.2 b (98)
	Flagship 0.22G	114 g/ft ht	Broadcast	0.5 a	0.2 c (99)	0.8 b (97)	0 b(100)
	Flagship 0.22G	227 g/ft ht	Broadcast	0.3 a	0 c (100)	0 b (100)	0.3 b (98)
	GF-2626 1SC	8 fl oz/100 gal	Foliar	0.5 a	2.0 bc (94)	3.2 b (87)	0 b(100)
	GF-2626 1SC	11 fl oz/100 gal	Foliar	1.0 a	2.3 bc (93)	7.8 b (68)	0 b(100)
	Xxpire 40WG	3.5 oz/100 gal	Foliar	0.8 a	1.3 c (96)	10.0 b (60)	1.8 b (85)
	Xxpire 40WG	7 oz/100 gal	Foliar	0.3 a	0.8 c (98)	0 b (100)	0 b(100)
	Orthene TTO	10.7 oz/100 gal	Foliar	0.7 a	0.8 c (98)	4.2 b (83)	0 b(100)
	Safari 20SG	6 g/in dbh	Drench	0.5 a	0.3 c (99)	3.3 b (87)	0 b(100)
	Talus 70DF	14 oz/100 gal	Foliar	0.7 a	6.2 bc (82)	0.3 b (99)	0 b(100)
Nontreated	-	-	-	3.0 a	33.8 a (0)	24.7 a (0)	12 a (0)
14 DAT 5/17	A16901B	5 oz/100 gal	Drench	2.2 a	0.7 a	22.5 a	3.7 a
	A16901B	10 oz/100 gal	Drench	1.0 a	1.3 a	10.0 a	2.2 a
	Arena 50WDG	2.4 g/in dbh	Drench	1.3 a	0.0 a	3.3 a	1.3 a
	Distance 10EC	12 fl oz/100 gal	Foliar	0.5 a	1.3 a	26.3 a	2.3 a
	Flagship 0.22G	114 g/ft ht	Broadcast	1.7 a	1.3 a	19.2 a	0.8 a
	Flagship 0.22G	227 g/ft ht	Broadcast	1.3 a	0.7 a	3.0 a	0.5 a
	GF-2626 1SC	8 fl oz/100 gal	Foliar	1.5 a	0.8 a	9.0 a	0.8 a

Count Date	Treatment	Rate	Application Method	Mean No. Per 2 Leaves (% Control)			
				Adults	Crawlers	Eggs	Nymphs
	GF-2626 ISC	11 fl oz/100 gal	Foliar	2.2 a	0.3 a	1.3 a	0.3 a
	Xxpire 40WG	3.5 oz/100 gal	Foliar	1.3 a	0.5 a	15.5 a	2.3 a
	Xxpire 40WG	7 oz/100 gal	Foliar	2.2 a	0.5 a	2.0 a	1.7 a
	Orthene TTO	10.7 oz/100 gal	Foliar	1.0 a	0.8 a	10.5 a	3.2 a
	Safari 20SG	6 g/in dbh	Drench	0.7 a	0.7 a	3.0 a	0.7 a
	Talus 70DF	14 oz/100 gal	Foliar	2.0 a	0.8 a	9.3 a	3.2 a
	Nontreated	-	-	2.7 a	1.0 a	11.1 a	0.7 a
28 DAT 5/31	A16901B	5 oz/100 gal	Drench	3.5 a	0.2 c (95)	20.7 bc (53)	3.2 b (90)
	A16901B	10 oz/100 gal	Drench	3.0 a	1.0 bc (76)	15.0 bc (66)	3.5 b (89)
	Arena 50WDG	2.4 g/in dbh	Drench	2.7 a	0.5 bc (88)	6.2 c (86)	12.5 ab (59)
	Distance 10EC	12 fl oz/100 gal	Foliar	5.0 a	6.7 a (0)	67.0 a (0)	13.7 ab (55)
	Flagship 0.22G	114 g/ft ht	Broadcast	3.5 a	2.7 bc (36)	22.2 bc (50)	11.0 ab (64)
	Flagship 0.22G	227 g/ft ht	Broadcast	2.7 a	0.5 bc (88)	5.3 c (88)	6.0 b (80)
	GF-2626 ISC	8 fl oz/100 gal	Foliar	2.7 a	0.5 bc (88)	7.8 c (82)	19.5 ab (36)
	GF-2626 ISC	11 fl oz/100 gal	Foliar	2.3 a	0.0 c (100)	23.2 a (48)	5.5 b (82)
	Xxpire 40WG	3.5 oz/100 gal	Foliar	1.2 a	1.0 bc (76)	15.7 bc (64)	4.7 b (85)
	Xxpire 40WG	7 oz/100 gal	Foliar	2.7 a	2.8 abc (33)	27.3 abc (38)	7.2 b (76)
	Orthene TTO	10.7 oz/100 gal	Foliar	4.3 a	3.5 abc (17)	55.3 ab (0)	20.5 ab (33)
	Safari 20SG	6 g/in dbh	Drench	4.8 a	0.8 bc (81)	2.8 c (94)	20.8 ab (32)
	Talus 70DF	14 oz/100 gal	Foliar	2.8 a	2.7 bc (36)	67.0 a (0)	12.5 ab (59)
	Nontreated	-	-	4.5 a	4.2 ab (0)	44.2 abc (0)	30.5 a (0)
5 Mo. 10/03	A16901B	5 oz/100 gal	Drench	2.8 cde	3.2 a	29.5 bcd (63)	2.3 a
	A16901B	10 oz/100 gal	Drench	2.0 de	0.5 a	20.5 bcd (74)	6.2 a
	Arena 50WDG	2.4 g/in dbh	Drench	0.3 e	0.5 a	0.3 d (100)	1.8 a
	Distance 10EC	12 fl oz/100 gal	Foliar	3.0 a-e	2.7 a	59.0 ab (26)	2.0 a
	Flagship 0.22G	114 g/ft ht	Broadcast	4.2 a-e	0.5 a	12.3 bcd (85)	1.2 a
	Flagship 0.22G	227 g/ft ht	Broadcast	2.2 de	3.8 a	3.5 cd (96)	3.8 a
	GF-2626 ISC	8 fl oz/100 gal	Foliar	5.5 a-d	7.0 a	46.3 a-d (42)	12.7 a
	GF-2626 ISC	11 fl oz/100 gal	Foliar	7.7 a	1.7 a	17.8 bcd (78)	9.2 a
	Xxpire 40WG	3.5 oz/100 gal	Foliar	6.8 abc	2.5 a	58.8 ab (27)	9.0 a
	Xxpire 40WG	7 oz/100 gal	Foliar	7.2 ab	4.0 a	36.3 a-d (55)	8.0 a
	Orthene TTO	10.7 oz/100 gal	Foliar	6.8 abc	5.8 a	51.0 abc (36)	20.2 a
	Safari 20SG	6 g/in dbh	Drench	0.0 e	0.0 a	0.0 d (100)	0.0 a
	Talus 70DF	14 oz/100 gal	Foliar	7.0 abc	0.2 a	38.4 a-d (52)	1.8 a
	Nontreated	-	-	7.7 a	6.2 a	80.0 a (0)	7.8 a

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

* First app 5/3 to coincide with crawler emergence. Second app 5/17 except for Distance which was applied on the 5/24 as a 21-day post second app.

Table 26. Efficacy of Insecticides on Magnolia White Scale on Southern Magnolia (*M. grandiflora*), Chen, LA, 2014.

Treatment	Rate Per 100 Gal	Applic. Method, Timing	Population Averages ^x (Percent Control)				
			30 DAT2	60 DAT2	90 DAT2	120 DAT2	180 DAT2
AzaGuard (azadirachtin)	20 fl oz	Foliar, 3/28	2.9 b (55)	2.8 b (54)	2.3 b (56)	3.4 a (35)	6.2 ab (9)
Distance (pyriproxyfen)	12 fl oz	Foliar, 3/28, 4/18	2.1 b (67)	0 c (100)	0 c (100)	0 c (100)	0.4 c (94)
Mainspring 200SC (cyantraniliprole)	8 fl oz	Drench, 4/11, 5/12	0 c (100)	0 c (100)	0 c (100)	0 c (100)	0.3 c (96)
Mainspring 200SC	12 fl oz	Drench, 4/11	0 c (100)	0 c (100)	0 c (100)	0 c (100)	0.8 c (88)
SuffOil-X (horticultural oil)	1 gal	Foliar 3/28, 4/11	0 c (100)	0 c (100)	0 c (100)	0 c (100)	1.7 bc (75)
Talus 70DF (buprofezin)	14 oz	Foliar, 3/28	0 c (100)	0 c (100)	0 c (100)	0 c (100)	0.8 c (88)
XXpire 40WG (spinetoram + sulfoxaflor) + Capsil	2 oz + 6 fl oz	Foliar, 3/28, 4/11	1.0 bc (84)	0.9 b (85)	1.5 bc (71)	2.6 ab (50)	4.1 abc (40)
XXpire 40WG + Capsil	2.75 oz + 6 fl oz	Foliar, 3/28, 4/11	0 c (100)	0 c (100)	0 c (100)	0 c (100)	1.7 bc (75)
XXpire 40WG + Capsil	3.5 oz + 6 fl oz	Foliar, 3/28, 4/11	1.6 bc (75)	0 c (100)	0 c (100)	0 c (100)	0.2 c (97)
Nontreated (water)	-	Foliar 3/28, 4/11	6.4 a (0)	6.1 a (0)	5.2 a (0)	5.2 a (0)	6.8 a (0)

^x Numbers of large size nymphs and adults on 6 leaves at days after 2nd application (DAT2). Means within column followed by the same letter are not significantly different (LSD, P=0.05).

Table 27. Efficacy on False Oleander Scale on Southern Magnolia, Chong, SC, 2014.

Treatment	Rate (per 100 gal)	Population Averages (Henderson's Percent Control) ^x				
		Pretreat	1 WAT ^y	2 WAT	4 WAT	6 MAT
Xxpire 40WG	2 oz	15.0 a	17.3 a (29)	3.8 b (87)	2.7 b (86)	3.5 b (84)
	2.75 oz	17.8 a	16.8 a (42)	2.7 b (92)	2.8 b (88)	2.8 b (89)
	3.5 oz	21.8 a	7.5 bc (79)	3.7 b (92)	2.7 b (90)	2.0 b (94)
Paraffin oil	2%	19.5 a	7.2 c (77)	1.3 b (97)	1.0 b (96)	1.8 b (94)
Nontreated	-	10.0 a	16.2 ab (0)	20.0 a (0)	12.8 a (0)	14.5 a (0)

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

^y WAT = weeks after the first treatment; MAT = months after first treatment.

* Treatments applied foliar on 4/13 and 4/27; Capsil (at 6 fl oz/100 gal) was mixed in the solutions of GF-2860.

Table 28. Efficacy on False Oleander Scale (Adult Females) on Japanese Aucuba, Held, MS, 2018.

Treatment	Rate	Mean percentage of live females before and after treatment (Henderson's Percent Control) ^x					
		Pretreat	7 DAIT ^c	14 DAIT ^c	28 DAIT ^c	4 MAIT ^c	6 MAIT ^c
Altus (flupyradifurone)	14 fl oz	80.0 a-d	38.0 bc (0)	40.0 abc (18)	36.0 abc (32)	56.0 abc (9)	42.0 a (21)
Azaguard (azadirachtin)	16 fl oz	76.0 cd	34.0 bcd (3)	43.0 ab (7)	49.0 ab (3)	47.0 abc (20)	51.0 a (0)
	32 fl oz	82.0 a-d	31.0 cde (18)	44.0 ab (12)	31.0 abc (43)	58.0 abc (8)	49.0 a (10)
Distance (pyriproxifen)	12 fl oz	88.0 abc	49.0 ab (0)	35.0 bc (35)	42.0 abc (28)	31.0 c (54)	38.0 a (35)
Pradia SL (cyclaniliprole + flonicamid) + Capsil	12 fl oz	90.0 ab	37.0 bc (11)	42.0 ab (23)	46.0 ab (23)	47.0 abc (32)	38.0 a (36)
	16.5 fl oz	77.0 cd	56.0 a (0)	58.0 a (0)	57.0 a (0)	64.0 a (0)	55.0 a (0)
Sarisa (cyclaniliprole) + NIS	22 fl oz	78.0 bcd	26.0 cde (27)	42.0 ab (11)	30.0 abc (42)	60.0 ab (0)	51.0 a (1)
	28 fl oz	84.0 a-d	30.0 cde (22)	32.0 bc (37)	22.0 cd (60)	48.0 abc (26)	50.0 a (10)
Talus 70DF (buprofezin)	14 oz	79.0 a-d	32.0 b-e (12)	41.0 abc (15)	48.0 ab (8)	35.0 bc (42)	59.0 a (0)
TriStar 8.5SL (acetamiprid)	16.5 fl oz	85.0 a-d	38.0 bc (3)	40.0 abc (23)	42.0 abc (25)	50.0 abc (24)	57.0 a (0)
Ventigra (afidopyropen) + UltraPure Oil	4.8 fl oz	76.0 cd	16.0 e (54)	28.0 bc (39)	27.0 bc (46)	57.0 abc (3)	61.0 a (0)
	7 fl oz	92.0 a	19.0 de (55)	23.0 c (59)	14.0 c (77)	32.0 bc (55)	43.0 a (29)
Nontreated	-	74.0 d	34.0 bcd (0)	45.0 ab (0)	49.0 ab (0)	57.0 abc (0)	49.0 a (0)
Statistics	-	F = 1.56 P = 0.137	F = 3.05 P = 0.003	F = 1.26 P = 0.270	F = 1.55 P = 0.138	F = 1.13 P = 0.362	F = 1.06 P = 0.414
<i>P</i> value (LSD)	-	<i>P</i> = 0.05	<i>P</i> = 0.05	<i>P</i> = 0.1	<i>P</i> = 0.05	<i>P</i> = 0.05	

^x LSD tests were conducted at both P=0.05 and 0.1. The letters within each column followed by the same letter were not significantly different at the P value listed in this cell under each column. No letters after each mean indicates no differences were detected at P=0.1.

* A sample of 25 adult female scales on a minimum of 5 leaves on each plant.

Post-treatments samples observed at days after initial treatment (DAIT) and months after initial treatment (MAIT).

Table 29. Efficacy on False Oleander Scale (All Stages) on Japanese Aucuba, Held, MS, 2018.

Treatment	Rate	Mean number (\pm SEM) of live FOS (all life stages) before and after treatment ^x					
		Pretreat	7 DAIT ^c	14 DAIT ^c	28 DAIT ^c	4 MAIT ^c	6 MAIT ^c
Altus (flupyradifurone)	14 fl oz	33.0 a	36.8 abc (22)	44.4 ab (0)	45.2 a (0)	53.8 bc (32)	128.2 ab (26)
Azaguard (azadirachtin)	16 fl oz	26.0 a	29.8 abc (19)	29.0 ab (10)	30.6 ab (10)	109.4 abc (0)	133.4 ab (2)
	32 fl oz	27.6 a	27.2 abc (31)	19.8 b (42)	13.8 b (62)	61.6 bc (6)	92.2 abc (36)
Distance (pyriproxifen)	12 fl oz	33.8 a	47.2 a (2)	56.3 ab (0)	27.4 ab (38)	75.8 abc (6)	93.8 abc (47)
Pradia SL (cyclaniliprole + flonicamid) + Capsil	12 fl oz	36.8 a	46.2 ab (12)	62.8 a (0)	27.8 ab (42)	122.8 abc (0)	120.6 abc (37)
	16.5 fl oz	30.4 a	37.4 abc (13)	19.2 b (49)	21.0 ab (47)	102.0 abc (0)	155.6 a (2)
Sarisa (cyclaniliprole) + NIS	22 fl oz	44.0 a	11.8 bc (81)	8.8 b (84)	8.6 b (85)	82.0 abc (22)	114.4 abc (50)
	28 fl oz	42.2 a	47.8 a (20)	39.2 ab (25)	26.0 ab (53)	149.8 ab (0)	103.8 abc (53)
Talus 70DF (buprofezin)	14 oz	31.4 a	23.0 abc (48)	21.2 b (46)	17.0 ab (59)	74.4 abc (1)	40.0 c (76)
TriStar 8.5SL (acetamiprid)	16.5 fl oz	35.4 a	36.6 abc (27)	24.0 ab (45)	12.4 b (73)	33.6 c (60)	59.0 bc (68)
Ventigra (afidopyropen) + UltraPure Oil	4.8 fl oz	42.2 a	9.8 c (84)	12.4 b (76)	12.6 b (77)	63.0 abc (37)	78.0 abc (65)
	7 fl oz	26.8 a	25.6 abc (33)	15.0 b (55)	5.6 b (84)	177.0 a (0)	117.7 abc (16)
Nontreated	-	25.6 a	36.4 abc (0)	31.8 ab (0)	33.6 ab (0)	61.0 abc (0)	133.6 ab (0)
Statistics	-	F= 0.57 P = 0.856	F= 1.01 P = 0.451	F= 1.28 P = 0.262	F= 0.88 P = 0.571	F= 0.81 P = 0.638	F= 0.68 P = 0.763
<i>P</i> value (LSD)	-		P = 0.05	P = 0.05	P = 0.1	P = 0.1	P = 0.1

^x LSD tests were conducted at both P=0.05 and 0.1. The letters within each column followed by the same letter were not significantly different at the P value listed in this cell under each column. No letters after each mean indicates no differences were detected at P=0.1.

* A sample of 10 leaves on each plant.

Post-treatments samples observed at days after initial treatment (DAIT) and months after initial treatment (MAIT).

Table 30. Number of Infested Leaves with Live False Oleander Scale on Japanese Aucuba, Held, MS, 2018.

Treatment	Rate	Mean number (\pm SEM) of leaves infested with live FOS before and after treatment ^x					
		Pretreat	7 DAIT ^c	14 DAIT ^c	28 DAIT ^c	4 MAIT ^c	6 MAIT ^c
Altus (flupyradifurone)	14 fl oz	7 \pm 0.71 ab	5.6 \pm 0.93	5.4 \pm 0.51 a	4.6 \pm 0.40 a-d	6.6 \pm 0.81 cd	9.6 \pm 0.24 a
Azaguard (azadirachtin)	16 fl oz	7 \pm 0.84 ab	5 \pm 0.55	4.2 \pm 0.58 abc	4.2 \pm 0.49 a-e	9.4 \pm 0.40 a	9.6 \pm 0.40 a
	32 fl oz	7.2 \pm 0.73 a	5.6 \pm 0.51	3.8 \pm 0.97 abc	3.4 \pm 0.51 b-e	7.6 \pm 1.03 a-d	8.6 \pm 0.93 abc
Distance (pyriproxifen)	12 fl oz	6.6 \pm 0.68 b	6 \pm 0.55	4.3 \pm 0.85 bc	3.6 \pm 0.68 b-e	3.6 \pm 1.2 e	9 \pm 0.41 abc
Pradia SL (cyclaniliprole + flonicamid) + Capsil	12 fl oz	7 \pm 0.71 ab	4.6 \pm 0.87	4.8 \pm 0.86 ab	4.8 \pm 0.73 abc	9 \pm 0.32 ab	8 \pm 1.0 bc
	16.5 fl oz	7.2 \pm 0.74 a	5.2 \pm 1.02	4.2 \pm 1.4 abc	5 \pm 1.05 ab	9.2 \pm 0.49 a	9.4 \pm 0.24 ab
Sarisa (cyclaniliprole) + NIS	22 fl oz	7 \pm 0.45 ab	4.4 \pm 0.68	2.8 \pm 0.73 c	2.6 \pm 0.93 cde	8.2 \pm 0.92 abc	8.8 \pm 0.37 abc
	28 fl oz	7 \pm 0.55 ab	4.2 \pm 1.2	4 \pm 0.63 abc	3.6 \pm 0.75 b-e	9 \pm 0.63 ab	9 \pm 0.45 abc
Talus 70DF (buprofezin)	14 oz	7.2 \pm 0.86 a	4.6 \pm 1.3	5.4 \pm 0.68 a	3.8 \pm 1.1 a-e	5.4 \pm 1.4 de	7.8 \pm 0.85 c
TriStar 8.5SL (acetamiprid)	16.5 floz	7 \pm 0.45 ab	5.6 \pm 0.75	4 \pm 0.71 abc	2.6 \pm 0.68 cde	6.8 \pm 0.37 bcd	8.8 \pm 0.37 abc
Ventigra (afidopyropen) + UltraPure Oil	4.8 fl oz	7.2 \pm 0.58 a	5 \pm 0.5	2.6 \pm 0.68 c	2.4 \pm 1.2 de	7.4 \pm 1.1 a-d	8.6 \pm 0.40 abc
	7 fl oz	6.8 \pm 0.66 ab	5.2 \pm 0.73	4 \pm 1.1 abc	2 \pm 0.71 e	6 \pm 2.1 e	9.3 \pm 0.67 ab
Nontreated	-	7 \pm 0.71 ab	5.4 \pm 0.24	3.8 \pm 0.86 abc	6 \pm 0.55 a	8.4 \pm 0.24 abc	8.4 \pm 1.1 abc
Statistics	-	F= 0.63 P= 0.804	F= 0.46 P= 0.927	F = 1.04 P= 0.427	F= 2.10 P=0.035	F= 3.67 P=0.0007	F= 0.80 P= 0.650
<i>P</i> value (LSD)	-	P= 0.1		P= 0.1	P= 0.05	P= 0.05	P= 0.1

^x LSD tests were conducted at both P=0.05 and 0.1. The letters within each column followed by the same letter were not significantly different at the P value listed in this cell under each column. No letters after each mean indicates no differences were detected at P=0.1.

* A sample of 25 adult female scales on a minimum of 5 leaves on each plant.

Post-treatments samples observed at days after initial treatment (DAIT) and months after initial treatment (MAIT).

Table 31. Efficacy on False Oleander Scale on Japanese Aucuba, Held, AL, 2019.

Treatment	Rate	Pretreat	7 DAIT ^c	14 DAIT ^c	28 DAIT ^c	4 MAIT ^c	6 MAIT ^c
Mean percentage (\pmSEM) of live females before and after treatment ^x							
Altus (flupyradifurone)	14 fl oz	14.7	12.8 abc (23)	12.7 (15)	14.7 ab (5)	23.2 a (0)	18.0 b (19)
Azaguard (azadirachtin)	16 fl oz	13.5	12.3 abc (19)	13.5 (1)	13.7 abc (4)	21.3 ab (0)	21.3 ab (0)
Distance (pyriproxifen)	12 fl oz	12.5	14.3 ab (0)	13.3 (0)	9.3 c (29)	5.8 c (71)	18.0 b (4)
Pradia SL (cyclaniliprole + flonicamid)	16.5 fl oz	12.7	10.7 abc (25)	12.0 (7)	16.5 a (0)	20.8 ab (0)	19.7 ab (0)
Sarisa (cyclaniliprole)	28 fl oz	14.2	8.7 c (46)	10.3 (29)	11.2 bc (25)	21.7 a (3)	19.7 ab (8)
KOC22018 (botanical oil blend)	16.5 fl oz	14.7	9.7 bc (41)	11.3 (24)	17.2 a (0)	19.5 ab (16)	20.0 ab (10)
Talus 70DF (buprofezin)	14 oz	12.8	11.7 abc (19)	10.5 (19)	9.5 c (29)	19.0 ab (6)	20.7 ab (0)
TetraCURB Conc (rosemary oil)	128 fl oz	14.5	12.7 abc (22)	12.2 (17)	17.3 a (0)	17.0 b (26)	19.2 ab (12)
TetraCURB Conc (rosemary oil)	128 fl oz	13.7	9.2 c (40)	10.8 (22)	10.7 bc (26)	20.7 ab (4)	22.3 a (0)
Ventigra (afidopyropen)	7 fl oz	10.3	10.8 abc (7)	13.6 (0)	17.0 a (0)	19.8 ab (0)	19.4 ab (0)
Nontreated	-	13.5	15.2 a (0)	13.7 (0)	14.2 ab (0)	21.3 ab (0)	20.3 ab (0)
<i>P value</i> (LSD)	-	<i>P</i> = 0.622	<i>P</i> = 0.224	<i>P</i> = 0.902	<i>P</i> = 0.0008	<i>P</i> < 0.0001	<i>P</i> = 0.371
Mean % reduction (\pmSEM) of live FOS (all life stages) before and after treatment ^x							
Altus (flupyradifurone)	14 fl oz	477.8	57.9 abc (70)	63.8 bcd (65)	67.4 cd (69)	51.0 ab (0)	22.3 bc (81)
Azaguard (azadirachtin)	16 fl oz	340.3	60.1 abc (56)	41.8 e (67)	64.6 d (58)	28.8 bc (21)	16.6 bc (81)
Distance (pyriproxifen)	12 fl oz	180.3	60.6 abc (16)	70.8 abc (0)	84.3 a (0)	70.3 a (0)	59.9 a (0)
Pradia SL (cyclaniliprole + flonicamid)	16.5 fl oz	290.5	55.5 abc (52)	63.7 bcd (42)	63.2 d (51)	11.3 c (64)	2.3 c (97)
Sarisa (cyclaniliprole)	28 fl oz	309.0	74.6 a (40)	74.1 ab (36)	82.1 ab (41)	32.1 bc (3)	16.8 bc (78)
KOC22018 (botanical oil blend)	16.5 fl oz	274.5	43.0 c (61)	50.4 de (51)	71.8 bcd (42)	15.6 bc (47)	13.4 c (80)
Talus 70DF (buprofezin)	14 oz	253.8	63.6 abc (37)	70.0 abc (27)	78.7 abc (31)	40.4 bc (0)	18.7 bc (71)
TetraCURB Conc (rosemary oil)	128 fl oz	223.8	59.6 abc (34)	56.4 cde (33)	74.5 abcd (26)	36.1 bc (0)	14.8 c (74)
TetraCURB Conc (rosemary oil)	128 fl oz	206.8	57.0 abc (31)	79.9 a (0)	85.0 \pm a (8)	42.3 bc (0)	25.6 bc (51)
Ventigra (afidopyropen)	7 fl oz	194.8	49.2 bc (37)	62.4 bcd (15)	72.1 bcd (17)	33.1 bc (0)	21.6 bc (56)
Nontreated	-	167.0	66.9 ab (0)	62.9 bcd (0)	74.9 abcd (0)	17.8 bc (0)	41.8 ab (0)
<i>P value</i> (LSD)	-	-	<i>P</i> = 0.2092	<i>P</i> = 0.001	<i>P</i> = 0.005	<i>P</i> = 0.0283	<i>P</i> = 0.054

^x LSD tests were conducted at both $P=0.05$ and 0.1 . The letters within each column followed by the same letter were not significantly different at the P value listed in this cell under each column. No letters after each mean indicates no differences were detected at $P=0.1$.

* A sample of 25 adult female scales on a minimum of 5 leaves on each plant. A sample of all life stage on 10 leaves on each plant. A 10 leaf sample from each plant was used to record the number of leaves infested.

Post-treatments samples observed at days after initial treatment (DAIT) and months after initial treatment (MAIT).

Table 32. Efficacy on False Oleander Scale on Japanese Aucuba, Held, AL, 2019.

Treatment	Rate	Mean number (\pm SEM) of leaves infested with live FOS before and after treatment ^x					
		Pretreat	7 DAIT ^c	14 DAIT ^c	28 DAIT ^c	4 MAIT ^c	6 MAIT ^c
Altus (flupyradifurone)	14 fl oz	10 \pm 0.0	10 \pm 0.0a	9.8 \pm 0.17a	10 \pm 0.0a	9.8 \pm 0.20a	10 \pm 0.0a
Azanguard (azadirachtin)	16 fl oz	10 \pm 0.0	10 \pm 0.0a	9.8 \pm 0.17a	9.5 \pm 0.22ab	10 \pm 0.0a	9.8 \pm 0.17a
Distance (pyriproxifen)	12 fl oz	10 \pm 0.0	9.7 \pm 0.33ab	9.8 \pm 0.17a	9 \pm 0.52ab	6.7 \pm 1.20b	8.7 \pm 0.49b
Pradia SL (cyclaniliprole + flonicamid)	16.5 fl oz	10 \pm 0.0	10 \pm 0.0a	10 \pm 0.0a	10 \pm 0.0a	10 \pm 0.0a	10 \pm 0.0a
Sarisa (cyclaniliprole)	28 fl oz	10 \pm 0.0	10 \pm 0.0a	9.2 \pm 0.31b	8.8 \pm 0.31b	9.7 \pm 0.33a	10 \pm 0.0a
KOC22018 (botanical oil blend)	16.5 fl oz	10 \pm 0.0	10 \pm 0.0a	9.8 \pm 0.17a	10 \pm 0.0a	10 \pm 0.0a	10 \pm 0.0a
Talus 70DF (buprofezin) TetraCURB	14 oz	9.8 \pm 0.17	10 \pm 0.0a	9.5 \pm 0.34ab	9 \pm 0.37ab	10 \pm 0.0a	10 \pm 0.0a
TetraCURB Conc (rosemary oil)	128 fl oz	10 \pm 0.0	9.5 \pm 0.22b	10 \pm 0.0a	9.8 \pm 0.17ab	10 \pm 0.0a	9.8 \pm 0.17a
TetraCURB Conc (rosemary oil)	128 fl oz	9.7 \pm 0.33	9.8 \pm 0.17ab	9.8 \pm 0.17a	7.2 \pm 0.75c	9.8 \pm 0.17a	10 \pm 0.0a
Ventigra (afidopyropen)	7 fl oz	9.8 \pm 0.17	10 \pm 0.0a	10 \pm 0.0a	9 \pm 0.45ab	10 \pm 0.0a	9.8 \pm 0.20a
Nontreated	-	10 \pm 0.0	10 \pm 0.0a	9.7 \pm 0.21ab	9.3 \pm 0.49ab	10 \pm 0.0a	10 \pm 0.0a
<i>P</i> value (LSD)	-	<i>P</i> = 0.623	<i>P</i> = 0.107	<i>P</i> = 0.104	<i>P</i> = 0.0001	<i>P</i> < 0.01	<i>P</i> < 0.001

^x LSD tests were conducted at both $P=0.05$ and 0.1 . The letters within each column followed by the same letter were not significantly different at the P value listed in this cell under each column. No letters after each mean indicates no differences were detected at $P=0.1$.

* A sample of 25 adult female scales on a minimum of 5 leaves on each plant. A sample of all life stage on 10 leaves on each plant. A 10 leaf sample from each plant was used to record the number of leaves infested.

Post-treatments samples observed at days after initial treatment (DAIT) and months after initial treatment (MAIT).

Florida Red Scale

Ludwig investigated efficacy of four neonicotinoids (Celero, Flagship, Safari and TriStar) have activity on Florida red scale (*Chrysomphalus aonidum*) infesting dwarf Burford holly (*Ilex cornuta* 'Burfordii Nana'). During this research, the average daily temperatures decreased which may have contributed to the increased mortality observed in all the treatments throughout the experiment. None of the treatments provided statistically or biologically significant mortality on this scale species at 32 or 43 days after treatment. Only the standard, Orthene provided statistically significant mortality for both small and large nymphs, but only 72% and 32% mortality was achieved respectively. More research is needed to determine viable product choices for Florida red scale.

Table 33. Efficacy on Florida Red Scale on Dwarf Burford Holly, Ludwig, TX, 2005.

Stage	Treatment	Rate	Population Averages (Henderson's Percent Control)			
			Pretreatment	7 DAT	15 DAT	29 DAT
Small Nymphs	Celero 16WSG	4 oz per 100 gal	50.0	39.2 cd (0)	27.2 a (0)	60.3 ab (0)
	Flagship	2 oz per 100 gal	50.0	69.6 a (0)	27.2 a (0)	56.3 ab (0)
	Flagship	4 oz per 100 gal	50.0	59.2 ab (0)	12.8 a (0)	81.9 a (0)
	Orthene TTO	8 oz per 100 gal	50.0	72.0 a (0)	37.6 a (0)	57.6 ab (0)
	Safari drench	12 oz/acre	50.0	61.6 ab (0)	24.8 a (0)	58.8 ab (0)
	Safari drench	24 oz/acre	50.0	44.0 bcd (0)	20.0 a (0)	60.7 ab (0)
	Safari foliar	4 oz per 100 gal	50.0	60.8 ab (0)	16.0 a (0)	71.8 ab (0)
	Safari foliar	8 oz per 100 gal	50.0	47.2 bcd (0)	14.4 a (0)	72.9 ab (0)
	TriStar 30SG	112 g per 100 gal	50.0	44.0 bcd (0)	35.2 a (0)	61.8 ab (0)
	TriStar 30SG	224 g per 100 gal	50.0	56.0 abc (0)	23.2 a (0)	54.7 ab (0)
	Nontreated Control		50.0	31.2 d (0)	8.8 a (0)	49.5 b (0)
Large Nymphs	Celero 16WSG	4 oz per 100 gal	0.0	4.0 c	36.0 a	53.7 a
	Flagship	2 oz per 100 gal	0.0	6.4 bc	18.4 ab	43.2 a
	Flagship	4 oz per 100 gal	0.0	13.6 bc	11.2 b	55.1 a
	Orthene TTO	8 oz per 100 gal	0.0	32.0 a	18.4 ab	64.0 a
	Safari drench	12 oz/acre	0.0	9.6 bc	25.6 ab	56.5 a
	Safari drench	24 oz/acre	0.0	20.0 ab	19.2 ab	67.7 a
	Safari foliar	4 oz per 100 gal	0.0	12.0 bc	12.0 b	56.1 a
	Safari foliar	8 oz per 100 gal	0.0	7.2 bc	14.4 ab	62.4 a
	TriStar 30SG	112 g per 100 gal	0.0	7.2 bc	18.4 ab	57.5 a
	TriStar 30SG	224 g per 100 gal	0.0	9.6 bc	25.6 ab	55.0 a
	Nontreated Control		0.0	7.2 bc	11.2 b	47.3 a
Total	Celero 16WSG	4 oz per 100 gal	50.0	43.2 (0)	63.2 (0)	114.0 (0)
	Flagship	2 oz per 100 gal	50.0	76.0 (0)	45.6 (0)	99.6 (0)
	Flagship	4 oz per 100 gal	50.0	72.8 (0)	24.0 (0)	137.0 (0)
	Orthene TTO	8 oz per 100 gal	50.0	104.0 (0)	56.0 (0)	121.6 (0)
	Safari drench	12 oz/acre	50.0	71.2 (0)	50.4 (0)	115.4 (0)
	Safari drench	24 oz/acre	50.0	64.0 (0)	39.2 (0)	128.4 (0)
	Safari foliar	4 oz per 100 gal	50.0	72.8 (0)	28.0 (0)	127.9 (0)
	Safari foliar	8 oz per 100 gal	50.0	54.4 (0)	28.8 (0)	135.2 (0)
	TriStar 30SG	112 g per 100 gal	50.0	51.2 (0)	53.6 (0)	119.3 (0)
	TriStar 30SG	224 g per 100 gal	50.0	65.6 (0)	48.8 (0)	109.8 (0)
	Nontreated Control		50.0	38.4 (0)	20.0 (0)	96.8 (0)

Gloomy Scale

In 2011 and 2014, Frank investigated the efficacy of systemic neonicotenoids (Flagship, Safari and Tristar), insect growth regulators (Distance and Talus), A16901B, Kontos, Rycar, Mainspring, SuffOil-X and XXpire for the control of gloomy scale (*Melanaspis tenebricosa*) on red maple (*Acer rubrum*). In 2011, all treatments were effective on nymphs and adults, with over 90 % control by 14 days after application (Table 34). However, abundance of gloomy scale was not significantly different between treatments on any of the observations in 2014 (Table 35).

No phytotoxicity was observed from any treatment.

Table 34. Efficacy on Gloomy Scale on Red Maple (*Acer rubrum*), Frank, NC, 2011.

Scale Stage	Treatment	Rate	Application Method	Mean No. Per Inch (Henderson's % Control)				
				Pretreat	7 DAT	14 DAT	28 DAT	180 DAT
Nymphs	A16901B	5 oz/100 gal	Drench	14.2 a	7.5b (87)	3.8b (97)	4.3b (99)	0.3b (99)
	Distance	12 fl oz/100 gal	Foliar	12.7 a	0.2b (100)	0.0b (100)	0.0b (100)	0.0b (100)
	Flagship 0.22G	114 g/ft ht	Broadcast	18.3 a	6.3 b (93)	0.5 b (100)	0.2 b (100)	0.0 b (100)
	Flagship 25WG	1 g/ft ht	Drench	8.7 a	2.5 b (97)	0.0 b (100)	0.0 b (100)	0.0 b (100)
	Kontos	3.4 fl oz/100 gal	Foliar	12.3 a	8.0 b (94)	5.2 b (96)	4.8 b (98)	0.2 b (99)
	Rycar 20SC	18 fl oz/100 gal	Foliar	19.5 a	11.8 b (85)	6.8 b (96)	5.7 b (99)	0.3 b (99)
	Paraffinic Oil	1.5 gal/100 gal	Foliar	10.5 a	5.3 b (87)	3.2 b (97)	5.3 b (98)	0.3 b (99)
	Safari 2G	60 g/in dbh	Broadcast	12.7 a	5.0 b (90)	0.7 b (99)	0.0 b (100)	0.0 b (100)
	Safari 20SG	12 oz/1 gal	Trunk	18.0 a	4.7 b (93)	0.0 b (100)	0.0 b (100)	0.0 b (100)
	Talus 70DF	14 oz/100 gal	Foliar	14.7 a	2.2 b (96)	0.2 b (100)	0.0 b (100)	0.0 b (100)
	Tristar 30SG	8 oz/100 gal	Foliar	13.0 a	3.3 b (94)	0.0 b (100)	0.0 b (100)	0.0 b (100)
	Nontreated	-	-	12.8 a	51.2 a (0)	125.8 a (0)	284.5 a (0)	34.0 a (0)
	Adults	A16901B	5 oz/100 gal	Drench	3.3 a	1.7 bc (74)	1.0 b (94)	1.2 b (95)
Distance		12 fl oz/100 gal	Foliar	4.7 a	0.0 c (100)	0.0 b (100)	0.0 b (100)	0.0 b (100)
Flagship 0.22G		114 g/ft ht	Broadcast	8.7 a	2.3 bc (87)	0.5 b (99)	0.0 b (100)	0.0 b (100)
Flagship 25WG		1 g/ft ht	Drench	2.5 a	0.8 bc (84)	0.0 b (100)	0.0 b (100)	0.0 b (100)
Kontos		3.4 fl oz/100 gal	Foliar	5.7 a	3.3 bc (71)	2.0 b (93)	1.3 b (97)	3.7 b (99)
Rycar 20SC		18 fl oz/100 gal	Foliar	10.2 a	5.2 b (74)	3.0 b (94)	2.2 b (97)	4.3 b (99)
Paraffinic Oil		1.5 gal/100 gal	Foliar	3.5 a	1.7 bc (75)	1.2 b (93)	1.3 b (95)	3.8 b (98)
Safari 2G		60 g/in dbh	Broadcast	4.8 a	2.0 bc (89)	0.0 b (100)	0.2 b (99)	0.0 b (100)
Safari 20SG		12 oz/1 gal	Trunk	8.0 a	2.0 bc (87)	0.0 b (100)	0.0 b (100)	0.0 b (100)
Talus 70DF		14 oz/100 gal	Foliar	6.7 a	0.7 c (96)	0.0 b (100)	0.0 b (100)	0.0 b (100)
Tristar 30SG		8 oz/100 gal	Foliar	6.0 a	0.3 c (97)	0.0 b (100)	0.0 b (100)	0.0 b (100)
Nontreated		-	-	5.5 a	10.8 a (0)	27.7 a (0)	37.3 a (0)	315.5 a (0)

* Means within a column followed by the same letter are not significantly different (LSD test, P= 0.05).

Table 35. Efficacy on Gloomy Scale on Red Maple (*Acer rubrum*), Frank, NC, 2014.

Treatment	Rate	Application Method	Mean No. Per Inch			
			Pre	14 DAT	30 DAT	172 DAT
Distance	12.0 oz/100 gal	Foliar	78.1 a	29.4 a	24.9 a	18.8 a
Mainspring 200SC	0.125 fl oz/in DBH	Drench	70.4 a	35.0 a	22.3 a	10.5 a
Mainspring 200SC	0.25 fl oz/in DBH	Drench	51.9 a	26.2 a	21.7 a	25.0 a
Suffoil-X	2 gal/100 gal	Foliar	27.5 a	14.0 a	17.2 a	17.9 a
Talus 70DF	14.0 oz/100 gal	Foliar	26.7 a	22.7 a	18.3 a	10.3 a
Tristar 30SG	8.0 oz/100 gal	Foliar	40.4 a	68.4 a	23.5 a	7.5 a
XXpire 40WG	2.0 oz/100 gal	Foliar	39.8 a	52.4 a	20.1 a	12.1 a
XXpire 40WG	2.75 oz/100 gal	Foliar	64.9 a	52.1 a	22.1 a	12.9 a
XXpire 40WG	3.5 oz/100 gal	Foliar	38.9 a	38.3 a	18.0 a	25.4 a
Nontreated	-	-	45.5 a	24.6 a	17.1 a	12.5 a

* Means within a column followed by the same letter are not significantly different (LSD test, P= 0.05).

Hemispherical Scale

During 2022, Dale examined 9 products or active ingredients for impact on hemispherical scale (*Saissetia coffeae*) infesting coontie cycads (*Zamia integrifolia*). At 7 DAT, ISM-555 exhibited statistically lower populations than the nontreated control plants (Table 36). By 14 DAT, all treatments except MBI-203 and Talus had statistically fewer populations than the nontreated controls, with the high rate of ISM-555 and TetraCurb Max showing 90% control. By 28 DAT, efficacy started to diminish with most treatments, but ISM-555 still exhibited efficacy greater than 90% and Talus treated plants showed 86% efficacy. A hard freeze in FL killed hemispherical scale (data not shown), but populations started rebounding by 112 DAT. All treatments appeared to reduce populations significantly after the freeze, regardless of previous impact.

Table 36. Efficacy for Hemispherical Scale on Coontie Cycads (*Zamia integrifolia*), Dale, NC, 2022.

Treatment	Mean (\pm SE) live hemispherical scale per coontie cycad plant (six plants per insecticide treatment)				
	Pre-count	7 DAT	14 DAT	28 DAT	112 DAT
ISM-555 (3.84 floz)	45.0	45.8 * (55)	60.8 *** (81)	8.8 *** (93)	0.0 *** (100)
ISM-555 (5.76 floz)	98.0	58.3 (73)	65.3 *** (90)	19.7 *** (93)	0.0 *** (100)
MBI-203 SC2 (128 floz)	85.7	151.8 (21)	351.8 (41)	301.3 (0)	0.5 *** (95)
MBI-306 (20 floz)	73.3	123.2 (25)	151.0 * (71)	115.3 (45)	0.2 *** (98)
SP3014 (32 floz + Capsil)	91.7	104.2 (49)	88.8 ** (86)	83.5 (68)	0.0 *** (100)
TetraCURB MAX (256 floz)	61.0	71.5 (48)	41.8 *** (90)	68.2 (61)	0.2 *** (98)
Ventigra + Capsil (7 oz)	59.2	55.5 (58)	75.3 ** (82)	77.3 (54)	0.0 *** (100)
V-10433 (11 floz)	28.3	95.7 (0)	113.0 ** (43)	92.2 (0)	0.0 *** (100)
Mainspring GNL (8 floz)	57.7	104.8 (19)	127.2 * (68)	68.7 (58)	0.2 *** (98)
Talus (14 floz)	82.2	224.5 (0)	234.8 (59)	33.2 * (86)	0.0 *** (100)
Velifer (13 floz)	76.3	63.3 (63)	72.8 ** (86)	58.0 (73)	0.0 *** (100)
Water Control (UTC)	67.0	150.0 (0)	468.0 (0)	190.5 (0)	8.3 (0)

Asterisks next to mean count values indicate statistical difference from the UTC using Dunnett's Method (*P<0.05; **P<0.001; ***P<0.0001).

*56 DAT was approximately two weeks after an extreme freeze event (four nights below 24°F), which killed all detectable scale insects across all treatments.

Oystershell Scale

In three experiments on oystershell scale (*Lepidosaphes ulmi*), Nielsen (Table 37 - Table 39) demonstrated that drench applications of Safari 20SG and foliar applications of Talus 40SC provided great control of this pest on tree lilac (*Syringasp.*) and Carolina silverbell (*Halesia carolina* var. 'Carolina'). The other products tested, Flagship 25WP, foliar Safari 20SG, MOI 201, Orthene TTO 97 and Tristar provided unacceptable control.

No phytotoxicity was observed on any of the treated plants

Table 37. Efficacy on Oystershell Scale on Tree Lilac 'Sensation', Nielsen, OH, 2005.

Treatment	Rate (Number of Applications)	No. Live Females in a 5 min Search*	Percent Control
Flagship 25WP	2.0 oz/100 gal (2)	4	27
Flagship 25WP	4.0 oz/100 gal (2)	7	0
Orthene 97	8.0 oz/100 gal (2)	3	45
Safari 20SG	4.0 oz/100 gal (2)	7	0
Safari 20SG	8.0 oz/100 gal (2)	5	9
Safari 20SG – Drench	3 g/ft of tree height	0.67	88
Safari 20SG – Drench	6 g/ft of tree height	0.25	95
Talus 40SC	21.5 fl oz/100 gal (2)	0.25	95
TriStar 70WSP	48 g/100 gal (2)	4.3	22
TriStar 70WSP	96 g/100 gal (2)	7.5	0
Nontreated check	-	5.5	-

* Two evaluators, so this equates to a 10 minute search/sample.

Table 38. Efficacy on Oystershell Scale on Carolina Silverbell, Nielsen, OH, 2005.

Treatment	Rate (Number of Applications)	No. Females with Eggs/m	Percent Control
Flagship 25WP	2.0 oz/100 gal (2)	11	21
Flagship 25WP	4.0 oz/100 gal (2)	8	43
Safari 20SG	4.0 oz/100 gal (2)	23	0
Safari 20SG	8.0 oz/100 gal (2)	55	0
Safari 20SG – Drench	3 g/ft of tree height	0	100
Safari 20SG – Drench	6 g/ft of tree height	0	100
Talus 40SC	21.5 fl oz/100 gal (2)	0	100
TriStar 70WSP	48 g/100 gal (2)	20	0
TriStar 70WSP	96 g/100 gal (2)	2*	86
Orthene 97	8.0 oz/100 gal (2)	10	26
Nontreated check	-	14	-

* Many dead nymphs.

Table 39. Efficacy on Oystershell Scale on Carolina Silverbell, Nielsen, OH, 2008.

Treatment	Rate Per 100 Gal	Application Method	Percent Infested 6/24/2008	Percent Infested 9/8/2008
Aloft SC	5 fl oz	Sprenc	50	0
Aloft SC	10 fl oz	Sprenc	50	0
MOI 201	1:500	Spray	100	0
MOI 201	1:800	Spray	100	0
Safari 20SG	6 g/ft height	Drench	50	0
Safari 20SG	12 g/ft height	Drench	0	0
TriStar 30SG	4 oz	Spray	100	0
TriStar 30 SG	8 oz	Spray	100	0
Nontreated	-	-	100	0

Applications were made on June 6, 2008.

Evaluations were made on June 24, 2008 for the 1st generation and on Sept 8, 2008 for the 2nd generation as number of live scales in a 2 minute search.

Pine Needle Scale.

Nielsen. In 2010 and 2011, Nielsen conducted two field experiments to determine the efficacy of several products on pine needle scale (*Phenacaspis pinifoliae*) on pine (*Pinus* sp.). In 2010, Aloft SC, Distance, Kontos, Rycar, Talus 70DF and Tristar 30SG provided complete or nearly complete control of second generation pine needle scale (Table 40). The only soil treatment that was effective 16-DAT was Safari 20SG. By 57-DAT, both formulations of Safari eliminated pine needle scale from treated trees. A16901B dramatically reduced scale survival. Neither formulation of Flagship was effective. In 2011, Talus 70DF, Tristar 30SG and horticultural oil provided complete control of pine needle scale nymphs within 12 DAT; Rycar was almost as effective (Table 41). Nineteen days later, control with Flagship 25WG, Safari 2G and Kontos improved. On Oct 6, more than 3.5 months after treatment, the scale population on trees treated with Kontos had recovered somewhat. No reproduction had occurred on trees treated with A16901B, Flagship 25WG, Safari 2G or Safari 20SG. No phytotoxicity was observed on any of the treated plants.

Jones. In 2012, Jones conducted a field experiment to determine the efficacy of several products on pine needle scale on Scotch pine (*Pinus sylvestris*). All treatments significantly reduced scale survival by 28 days post-treatment; Flagship provided poor control, GF-2626 and Safari provided mediocre control, and Xxpire provided good control at the high rate (Table 42). By 180 DAT, all treatments, except Flagship, significantly reduced scale cover presence and increased aesthetic appearance of pine leaves. No phytotoxicity was observed on any of the treated plants.

Sadof. In 2015, Sadof conducted a field experiment to determine the efficacy of several products targeted to overwintering females and young crawlers of the first generation on pine needle scale on white pine (*Pinus strobus*). There were no significant differences among scale densities on 7 and 14 DAT (Table 43). However, at 28 and 167 DAT, Xxpire and Distance significantly reduced densities of pine needle scale. To directly assess the capacity of an insecticide to kill the scales, mortality at different times was calculated. At 7 DAT Horticultural oil caused higher mortality when compared with the water control; Xxpire and Horticultural oil caused higher mortality at 14 DAT (Table 44). At 167 DAT, Distance, Horticultural oil and Xxpire at the high rate showed superior mortality when compared with the water control.

Table 40. Efficacy on Pine Needle Scale on Pine, Nielsen, OH, 2010.

Treatment	Rate per 100 Gal	Application Method	No New Adults (% Control) 7/30/2010	% Mortality of 1 st Gen Nymphs 7/30/2010	No. New Adults (% Control) 9/9/2010
A16901B	10 oz	Drench	89 (11)	34	7 (88)
Aloft SC	10 fl oz	Sprenc	0 (100)	100	-
Distance	12 fl oz	Spray	0 (100)	100	-
Flagship 0.22G	227 g/in dbh	Broadcast	100 (0)	8	78 (0)
Flagship 25WG	4 g/in dbh	Drench	100 (0)	18	42 (28)
Kontos	3.4 fl oz	Spray	0 (100)	62	-
Rycar	18 fl oz	Spray	0 (100)	100	-
Safari 2G	60 g/in dbh	Broadcast	84 (16)	63	0 (100)
Safari 20SG	6 g/in dbh	Drench	0 (100)	96	0 (100)
Talus 70DF	14 oz	Spray	1 (99)	99	-
TriStar 30SG	8 oz	Spray	0 (100)	100	-
Nontreated	-	-	100 (0)	24	58 (0)

Applications were made on July 14, 2010.

Evaluations were made on July 30 and September 9 (soil treatments only).

Table 41. Efficacy on Pine Needle Scale on Pine, Nielsen, OH, 2011.

Treatment	Rate per 100 Gal	Application Method	% Mortality of 1 st Gen Nymphs		Presence (+) or Absence (A) of 2 nd Gen Eggs on 10/6/11			
			6/1/11	6/20/11	Rep 1	Rep 2	Rep 3	Rep 4
A16901B	10 oz	Drench	27	29	A	A	A	A
Flagship 0.22G	227 g/ft ht	Broadcast	23	13	+	A	A	+
Flagship 25WG	4 g/ft ht	Drench	27	83	A	A	A	A
Kontos	3.4 fl oz	Spray	52	90	+	+	+	+ ^y
Rycar	18 fl oz	Spray	97 ^x	*	This treatment not re-sampled			
Safari 2G	60 g/in dbh	Broadcast	8	67	A	A	A	A
Safari 20SG	6 g/in dbh	Drench	82	100	A	A	A	A
Sunspray Ultra-Fine Oil	2 % v:v	Spray	100	*	This treatment not re-sampled			
Talus 70DF	14 oz	Spray	100	*	This treatment not re-sampled			
TriStar 30SG	8 oz	Spray	100	*	This treatment not re-sampled			
Nontreated	-	-	12	13	+	+	+	+

Applications were made on May 20, 2011.

^x Scales died more slowly in this, effective treatment.

^y Many fewer new female scales on new growth than on Nontreated check trees.

* This treatment not re-sampled.

Table 42. Efficacy on Pine Needle Scale on Scotch Pine, Jones, OH, 2012.

Treatment	Rate	Application Method	% Scale Infestation 5/2	% Mortality 5/10	% Mortality 5/17	% Mortality 5/31	% Mortality 10/23	% Scale Infestation 10/23	% Reduction 10/23
Flagship G	227 g/ft ht	Broadcast	29.17 a	56.00 a	30.17 a	49.00 b	55.33 a	11.25 a	62.11 ab
GF-2626 1SC	8 oz/100 gal	Foliar	11.5 a	38.17 a	40.50 a	57.67 b	42.83 a	1.83 a	82.33 a
GF-2626 1SC	11 fl oz/100 gal	Foliar	34.17 a	54.33 a	36.83 a	69.00 ab	65.83 a	9.08 a	78.47 a
XXpire 40WG	3.5 oz/100 gal	Foliar	23.17 a	33.67 a	13.33 a	53.67 b	52.33 a	8.83 a	69.06 a
XXpire 40WG	7 oz/100 gal	Foliar	31.17 a	46.50 a	37.67 a	83.83 a	53.67 a	7.67 a	70.06 a
Safari 20SG	6 g/ft ht	Drench	26.83 a	51.67 a	20.83 a	71.83 ab	54.50 a	4.50 a	84.93 a
Nontreated	-	-	23.92 a	0.00 a	0.00 a	3.67 c	13.67 b	16.00 a	33.06 b

^xMeans followed by same letter do not significantly differ (P=.05, Duncan's New MRT).

* All treatments applied on 5/3/12; foliar treatments applied a second time on 7/6/12.

Table 43. Efficacy on Pine Needle Scale on White Pine (*Pinus strobus*), Sadof, IN, 2015a.

Treatment	Rate Per 100 Gal	Applic Dates	Number of Live Scales Per cm ^x				
			Pretreat	7 DAT (1st instar) ^y	14 DAT (2nd instar)	28 DAT (Adults)	167 DAT (Adults)
Distance	12 fl oz	5/1	0.86 a	0.08 a (0)	0.38 a (0)	0.66 bc (0)	0.01 a (62)
Horticultural oil	labeled rate	5/1	1.08 a	0.14 a (0)	0.23 a (29)	0.29 ab (24)	0.03 ab (20)
IKI-3106	28 fl oz	5/1, 14	1.76 a	0.09 a (0)	0.43 a (19)	1.01 cd (0)	0.18 c (0)
IKI-3106	22 fl oz	5/1, 14	1.40 a	0.18 a (0)	0.70 a (0)	0.97 cd (0)	0.18 c (0)
Kontos Drench	3.4 fl oz	5/1	1.95 a	0.11 a (0)	0.52 a (11)	0.99 cd (0)	0.11 c (0)
Kontos Foliar	3.4 fl oz	5/1	1.91 a	0.14 a (0)	0.53 a (7)	0.56 abc (18)	0.11 c (0)
Mainspring 200SC	0.125 fl oz per ft ht	5/1	2.85 a	0.17 a (0)	0.84 a (2)	1.66 d (0)	0.13 c (0)
Mainspring 200SC	0.25 fl oz per ft ht	5/1	1.00 a	0.05 a (0)	0.47 a (0)	0.94 cd (0)	0.16 c (0)
Safari 20SG	18 oz	5/1	1.62 a	0.16 a (0)	1.22 a (0)	0.68 bc (0)	0.02 ab (67)
XXpire 40WG + Capsil	2.75 oz + 6 fl oz	5/1, 14	2.21 a	0.11 a (0)	0.69 a (0)	0.51 abc (35)	0.08 bc (0)
XXpire 40WG + Capsil	3.5 oz + 6 fl oz	5/1, 14	1.35 a	0.11 a (0)	0.41 a (0)	0.13 a (73)	0.01 a (75)
Nontreated	-	-	2.56 a	0.10 a (0)	0.77 a (0)	0.91 c (0)	0.09 bc (0)

^x Means within a column followed by the same letter are not significantly different (Fisher's LSD, P= 0.05).

^y DAT = days after the first treatment.

* Mainspring applied as drench at 0.125 and 0.25 fl oz per foot tree height.

Table 44. Efficacy on Pine Needle Scale on White Pine (*Pinus strobus*), Sadof, IN, 2015b.

Treatment	Rate Per 100 Gal	Application Dates	Mortality on Needles			
			7 DAT (1st instar) ^y	14 DAT (2nd instar)	28 DAT (Adults)	167 DAT (Adults)
Distance	12 fl oz	5/1	0.27 bc	0.40 cde	0.26 a	0.81 a
Horticultural oil		5/1	0.55 a	0.55 bc	0.29 a	0.84 a
IKI-3106	28 fl oz	5/1, 14	0.30 bc	0.26 def	0.51 a	0.31 c
IKI-3106	22 fl oz	5/1, 14	0.09 c	0.40 cde	0.54 a	0.37 bc
Kontos Drench	3.4 fl oz	5/1	0.13 c	0.20 e	0.62 a	0.45 bc
Kontos Foliar	3.4 fl oz	5/1	0.17 bc	0.42 cd	0.42 a	0.38 bc
Mainspring 200SC	0.125 fl oz per ft ht	5/1	0.16 bc	0.14 f	0.63 a	0.48 bc
Mainspring 200SC	0.25 fl oz per ft ht	5/1	0.06 c	0.29 def	0.51 a	0.39 bc
Safari 20SG	18 oz	5/1	0.38 ab	0.35 def	0.35 a	0.67 ab
XXpire 40WG + Capsil	2.75 oz + 6 fl oz	5/1, 14	0.12 c	0.65 b	0.20 a	0.20 c
XXpire 40WG + Capsil	3.5 oz + 6 fl oz	5/1, 14	0.17 bc	0.81 a	0.55 a	0.82 a
Nontreated	-	-	0.14 bc	0.29 def	0.66 a	0.41 bc

^x Means within a column followed by the same letter are not significantly different (Fisher's LSD, P= 0.05).

^y DAT = days after the first treatment.

* Mainspring applied as drench at 0.125 and 0.25 fl oz per foot tree height.

Tea Scale.

During 2009, two researchers evaluated the efficacy of several products on tea scale (*Fiorinia theae*). Hesselein evaluated Safari on tea scale infesting dwarf Burford holly (*Ilex cornuta*) 'Burfordii Nana' in a commercial landscape. Both Safari 20SG drench and 2G soil treatment significantly increased mortality of female tea scale (Table 45). Ludwig evaluated efficacy of Safari, Talus and Triact on tea scale (*Fiorinia theae*) infesting Japanese camellia (*Camellia japonica*) grown in containers. Safari drench was the only treatment that resulted in significantly higher mortality 32 and 68 days after treatment (Table 46). Sixty-eight days after the Safari 20SG treatment was applied, 100% of the female scales were dead.

In 2010, Frank evaluated Kontos, Safari and Talus on tea scale infesting Japanese camellia (*Camellia japonica*) grown in containers. Scale abundance was significantly less than the Nontreated control in all treatments by 7 DAT (Table 47). Differences persisted through the experiment to the last sample date 70 DAT.

In 2014, Chen conducted an experiment examining efficacy of various insecticides on tea scale on sasanqua (*Camellia sasanqua*) 'Mountain Snow'. All treatments, including the standard SuffOil-X, provided good to excellent control of a moderate to high infestation within 60 days after the second application (Table 48). XXpire at 3.5 oz per 100 gal provided the best control.

In 2014, Arthurs evaluated the efficacy of various insecticides applied in the spring against crawler stages of tea scale infesting Japanese camellia (*C. japonica*) 'In the Pink'. All treatments provided excellent control of tea scale during the experiment (Table 49, Table 50). XXpire, Distance, SuffOil-X and Safari, eliminated (or came close to eliminating) the scale infestation, whereas some residual scale infestation remained in the Mainspring and Talus treatments at the end of the experiment, providing the likelihood for scale reestablishment in the following year.

Table 45. Efficacy on Tea Scale on Dwarf Burford Holly 'Burfordii Nana', Hesselein, AL, 2009.

Treatment	Rate	Application Method	Average % Mortality				
			Pretreatment	10 DAT	14 DAT	31 DAT	42 DAT
Safari 20SG	6 g/ft height	Drench	52 a	96 a	84 a	90 a	94 a
Safari 2G	60 g/ft height	Soil surface	50 a	91 a	86 a	81 ab	92 a
Saf-T-Side Oil	2 % solution	Foliar	50 a	93 a	91 a	91 a	97 a
Nontreated	-	-	51 a	63 b	59 b	68 b	67 b

* Means within a column followed by the same letter are not significantly different (Tukey'sHSD, P< 0.05).

Table 46. Efficacy on Tea Scale on Japanese Camellia (*Camellia japonica*), Ludwig, TX, 2009.

Treatment	Rate	Application Method	Percent Female Adult Scale Mortality			
			Pretreatment	14 DAT	32 DAT	68 DAT
Safari 2G	2.6 g/gallon of media	Media mix	41.6a	90.4a	69.0ab	45.6a
Safari 20SG	24 oz/100gal	Drench	37.4a	92.0a	98.4b	100b
Talus 40 SC	21.5 fl oz/100 gal	Foliar	52.7a	85.3a	54.7a	69.3a
Triact 70	2 gal/100 gal	Foliar	76.0a	93.3a	60.0a	72.7a
Nontreated	-	-	60.7a	78.0a	38.7a	45.3a

* Means within a column followed by the same letter are not significantly different (Tukey's HSD, P< 0.05).

Table 47. Efficacy on Tea Scale on Japanese Camellia, Frank, NC, 2010.

Treatment	Rate	Application Method	No. of Scales (Henderson's % Control)				
			Pretreatment	7 DAT	14 DAT	28 DAT	70 DAT
Kontos	3.4 fl oz/100 gal	Foliar	133.5 a	9.2 b (91)	4.5 b (95)	0.8 b (99)	0.0 b (100)
Safari 2G	2.6 g/gal media	Broadcast	134.7 a	14.0 b (87)	6.5 b (93)	2.0 b (97)	0.0 b (100)
Safari 20SG	24 oz/100 gal	Drench	161.7 a	14.7 b (88)	7.2 b (94)	1.5 b (98)	0.0 b (100)
Talus 70DF	14 oz/100 gal	Foliar	152.0 a	13.5 b (89)	6.3 b (94)	1.8 b (98)	6.3 b (92)
Nontreated	-	-	128.8 a	99.7 a (0)	90.7 a (0)	68.8 a (0)	66.7 a (0)

* Means within a column followed by the same letter are not significantly different (LSD test, P= 0.05).

Table 48. Efficacy of Insecticides on Tea Scale on Sasanqua (*Camellia sasanqua*), Chen, LA, 2014.

Treatment	Rate Per 100 Gal	Applic. Method, Timing	No. of Scales (% Control)			
			Nymphs	Adults	Crawlers	Total
<i>30 DAT2</i>						
AzaGuard (azadirachtin)	20 fl oz	Foliar, 3/28	2.4 a (71)	1.4 ab (72)	0.9 ab (0)	4.7 ab (66)
Distance (pyriproxyfen)	12 fl oz	Foliar, 3/28, 4/18	3.4 a (60)	4.3 ab (14)	0 b (100)	7.7 ab (44)
Mainspring 200SC	12 fl oz	Drench, 4/11	1.8 a (79)	2.0 ab (60)	1.6 a (0)	5.4 ab (61)
Mainspring 200SC (cyanthraniliprole)	8 fl oz	Drench, 4/11, 5/12	3.0 a (64)	0 b (100)	0.2 ab (50)	3.2 b (77)
SuffOil-X (horticultural oil)	1 gal	Foliar 3/28, 4/11	6.1 a (27)	0 b (100)	0 b (100)	6.1 ab (56)
Talus 70DF (buprofezin)	14 oz	Foliar, 3/28	1.3 a (85)	6.7 a (0)	0 b (100)	8.0 ab (42)
Xxpire 40WG (spinetoram + sulfoxaflor) + Capsil	2 oz + 6 fl oz	Foliar, 3/28, 4/11	3.4 a (60)	0 b (100)	0 b (100)	3.4 b (75)
Xxpire 40WG + Capsil	2.75 oz + 6 fl oz	Foliar, 3/28, 4/11	2.5 a (70)	1.8 ab (64)	0.2 ab (50)	4.5 ab (67)
Xxpire 40WG + Capsil	3.5 oz + 6 fl oz	Foliar, 3/28, 4/11	4.9 a (42)	0.7 b (86)	0 b (100)	5.6 ab (59)
Nontreated (water)	-	Foliar 3/28, 4/11	8.4 a (0)	5.0 ab (0)	0.4 ab (0)	13.8 a (0)
<i>60 DAT2</i>						
AzaGuard (azadirachtin)	20 fl oz	Foliar, 3/28	1.7 b (88)	0.6 b (92)	0.3 b (62)	2.5 bc (88)
Distance (pyriproxyfen)	12 fl oz	Foliar, 3/28, 4/18	2.8 b (80)	2.1 b (71)	0 b (100)	4.8 bc (78)
Mainspring 200SC	12 fl oz	Drench, 4/11	4.2 b (69)	3.4 b (53)	2.0 a (0)	9.5 b (56)
Mainspring 200SC (cyanthraniliprole)	8 fl oz	Drench, 4/11, 5/12	1.9 b (86)	0.4 b (95)	0 b (100)	2.3 bc (89)
SuffOil-X (horticultural oil)	1 gal	Foliar 3/28, 4/11	3.7 b (73)	0 b (100)	0 b (100)	3.7 bc (83)
Talus 70DF (buprofezin)	14 oz	Foliar, 3/28	2.4 b (82)	3.3 b (55)	0.3 b (62)	6.0 bc (72)
Xxpire 40WG (spinetoram + sulfoxaflor) + Capsil	2 oz + 6 fl oz	Foliar, 3/28, 4/11	0.1 b (99)	0.5 b (93)	0.3 b (62)	0.9 bc (96)
Xxpire 40WG + Capsil	2.75 oz + 6 fl oz	Foliar, 3/28, 4/11	1.9 b (86)	2.3 b (68)	0 b (100)	4.2 bc (81)
Xxpire 40WG + Capsil	3.5 oz + 6 fl oz	Foliar, 3/28, 4/11	0 b (100)	0 b (100)	0 b (100)	0 c (100)
Nontreated (water)	-	Foliar 3/28, 4/11	13.7 a (0)	7.3 a (0)	0.8 ab (0)	21.8 a (0)

^x Numbers on 6 leaves at days after 2nd application (DAT2). Means within column followed by the same letter are not significantly different (LSD, P=0.05).

Table 49. Efficacy on Tea Scale on Japanese Camellia, (*Camellia japonica*) 'In the Pink' (Counts), Arthurs, FL, 2014.

Treatment	Rate Per 100 Gal	Applic. Method, Timing	Population Averages ^x (Henderson's Percent Control)						
			Pretreat	7 DAT	14 DAT	21 DAT	35 DAT	76 DAT	150 DAT
<i>Total # tea scale (adults + large nymphs) per older leaf</i>									
Distance	12 floz	Foliar, 3/13, 4/3	71.0 a	53.8 a (36)	60.8 a (3)	33.9 a (19)	38.2 a (9)	3.1 a-d (63)	0.3 d (99)
Xxpire 40WG + Capsil	2 oz + 6 fl oz	Foliar, 3/13, 3/27	71.8 a	64.9 a (23)	64.9 a (0)	58.6 a (0)	28.8 a (32)	0.3 d (96)	2.0 cd (96)
Xxpire 40WG + Capsil	2.75 oz + 6 fl oz	Foliar, 3/13, 3/27	63.7 a	44.9 a (40)	37.5 a (33)	19.6 a (48)	21.8 a (42)	0.3 d (96)	0.1 d (99)
Xxpire 40WG + Capsil	3.5 oz + 6 fl oz	Foliar, 3/13, 3/27	67.3 a	47.8 a (40)	60.1 a (0)	35.0 a (12)	28.4 a (39)	3.4 a-d (57)	0.3 d (99)
Mainspring 200SC	8 floz	Drench, 3/13, 4/10	68.7 a	65.5 a (19)	48.9 a (19)	42.6 a (0)	31.8 a (22)	15.4 ab (0)	9.6 bc (78)
Mainspring 200SC	12 floz	Drench, 3/13	71.0 a	93.8 a (0)	61.7 a (1)	38.6 a (8)	36.3 a (14)	16.9 a (0)	13.3 b (71)
Safari 20SG	24 oz	Drench, 3/13	70.3 a	62.5 a (24)	79.8 a (0)	24.1 a (42)	27.1 a (35)	2.6 bcd (68)	0.0 d (100)
SuffOil-X	2 gal	Foliar, 3/13, 3/27, 4/10	67.7 a	47.6 a (40)	57.0 a (4)	20.6 a (48)	20.2 a (50)	1.8 cd (77)	0.0 d (100)
Talus 70DF	14 oz	Foliar, 3/13, 3/27	68.4 a	71.2 a (12)	72.9 a (0)	43.6 a (0)	38.5 a (5)	14.7 abc (0)	1.5 cd (97)
Nontreated	-	-	75.9 a	89.3 a (0)	66.7 a (0)	44.8 a (0)	44.9 a (0)	8.9 abc (0)	49.2 a (0)
<i>Total # tea scale (adults + large nymphs) per new leaf (seasonal growth)</i>									
Distance	12 floz	Foliar, 3/13, 4/3	n/a	n/a	0.0 a (100)	0.0 a (100)	0.0 b (100)	0.0 b (100)	0.3 c (99)
Xxpire 40WG + Capsil	2 oz + 6 fl oz	Foliar, 3/13, 3/27	n/a	n/a	0.0 a (100)	0.0 a (100)	0.0 b (100)	0.1 b (99)	0.2 c (99)
Xxpire 40WG + Capsil	2.75 oz + 6 fl oz	Foliar, 3/13, 3/27	n/a	n/a	0.0 a (100)	0.0 a (100)	0.0 b (100)	0.0 b (100)	0.1 c (99)
Xxpire 40WG + Capsil	3.5 oz + 6 fl oz	Foliar, 3/13, 3/27	n/a	n/a	0.0 a (100)	0.0 a (100)	0.0 b (100)	0.0 b (100)	0.3 c (99)
Mainspring 200SC	8 floz	Drench, 3/13, 4/10	n/a	n/a	0.0 a (100)	0.0 a (100)	0.2 ab (75)	0.4 b (98)	7.4 b (84)
Mainspring 200SC	12 floz	Drench, 3/13	n/a	n/a	0.0 a (100)	0.0 a (100)	1.0 a (0)	0.1 b (99)	5.0 b (90)
Safari 20SG	24 oz	Drench, 3/13	n/a	n/a	0.1 a (95)	0.2 a (78)	0.0 b (100)	0.0 b (100)	0.0 c (100)
SuffOil-X	2 gal	Foliar, 3/13, 3/27, 4/10	n/a	n/a	0.0 a (100)	0.0 a (100)	0.0 b (100)	0.0 b (100)	0.0 c (100)
Talus 70DF	14 oz	Foliar, 3/13, 3/27	n/a	n/a	0.0 a (100)	0.7 a (22)	0.2 ab (75)	0.0 b (100)	3.5 b (93)
Nontreated	-	-	n/a	n/a	2.0 a (0)	0.9 a (0)	0.8 a (0)	21.3 a (0)	47.6 a (0)

^x Data based on average of 6 plants. Column means followed by different letters (where present) are significantly different (P<0.05, Tukey's HSD).

^y Data based on average of 6 plants rated on a 5 point scale where 0 = no infestation, 1 = ≤ 10% leaf infestation, 2 = 11–30%, 3 = 31–50%, 4 = 51–70%, 5 = ≥ 71% leaf infestation. Chi-square values (2-sided tests) based on cross tabulation among treatment and infestation scale.

Table 50. Efficacy on Tea Scale on Japanese Camellia, (*Camellia japonica*) 'In the Pink' (Infestation Index), Arthurs, FL, 2014.

Treatment	Rate Per 100 Gal	Applic. Method, Timing	Population Averages ^x (Henderson's Percent Control)						
			Pretreat	7 DAT	14 DAT	21 DAT	35 DAT	76 DAT	150 DAT
<i>Infestation Index</i> ^y									
Distance	12 floz	Foliar, 3/13, 4/3	2.7 a	2.2 a	2.0 a	1.8 a	1.3 a	0.8 a	0.0 a
Xxpire 40WG + Capsil	2 oz + 6 fl oz	Foliar, 3/13, 3/27	2.2 a	2.0 a	1.8 a	1.7 a	1.3 a	0.8 a	0.5 a
Xxpire 40WG + Capsil	2.75 oz + 6 fl oz	Foliar, 3/13, 3/27	2.0 a	1.8 a	1.8 a	1.3 a	1.2 a	1.0 a	0.2 a
Xxpire 40WG + Capsil	3.5 oz + 6 fl oz	Foliar, 3/13, 3/27	2.2 a	1.7 a	1.8 a	1.5 a	1.3 a	1.0 a	0.2 a
Mainspring 200SC	8 floz	Drench, 3/13, 4/10	2.5 a	2.5 a	2.2 a	1.7 a	1.3 a	1.0 a	1.3 a
Mainspring 200SC	12 floz	Drench, 3/13	2.7 a	2.7 a	2.3 a	1.7 a	1.5 a	1.2 a	2.0 a
Safari 20SG	24 oz	Drench, 3/13	2.5 a	2.5 a	2.2 a	1.3 a	1.3 a	0.8 a	0.0 a
SuffOil-X	2 gal	Foliar, 3/13, 3/27, 4/10	2.7 a	2.0 a	1.7 a	1.3 a	1.3 a	0.5 a	0.0 a
Talus 70DF	14 oz	Foliar, 3/13, 3/27	2.5 a	2.8 a	2.5 a	1.8 a	1.5 a	1.2 a	0.8 a
Nontreated	-	-	2.3 a	2.3 a	2.3 a	1.7 a	1.8 a	1.0 a	2.5 b

^x Data based on average of 6 plants. Column means followed by different letters (where present) are significantly different ($P < 0.05$, Tukey's HSD).

^y Data based on average of 6 plants rated on a 5 point scale where 0 = no infestation, 1 = $\leq 10\%$ leaf infestation, 2 = 11–30%, 3 = 31–50%, 4 = 51–70%, 5 = $\geq 71\%$ leaf infestation. Chi-square values (2-sided tests) based on cross tabulation among treatment and infestation scale.

During 2015, four researchers investigated the efficacy of various insecticides on tea scale (*Fiorinia theae*). Braman evaluated efficacy of BAS 440, BYI-2960, Distance, Distance + Tristar, IKI-3106, Mainspring and Talus on tea scale crawlers infesting Japanese camellia (*C. japonica*). All treatments, except Mainspring at the low rate, provided significant control by 28 DAT after applying most of the 2nd and 3rd applications (Table 51). Six months after the initial application, all treatments kept the population to low levels. Chen evaluated efficacy of Distance, IKI-3106, Mainspring, Talus 70DF, Ultra-Pure Oil, Distance + TriStar, and BAS 440 + Ultra-Pure Oil applied foliar twice on 14-day intervals on tea scale crawlers infesting Japanese camellia. Talus 70DF provided the best control keeping total scale density less than 0.6 per leaf for up to 157 DAT. Distance and Distance + TriStar provided similar control with both being effective in keeping total scale density below 1 per leaf for up to 157 DAT. BAS440 + Ultra-Pure Oil provided better control than Ultra-Pure Oil alone, with the former being effective up to 128 DAT and the later up to 90 DAT. Mainspring and IKI-3106 provided less residual efficacy. Chong evaluated efficacy of BAS 440 + Ultra-Pure Oil, BYI-2960, Distance, IKI-3106, Mainspring, and Talus 70DF on tea scale crawlers infesting holly (Table 52). Distance, Talus, Distance + TriStar and BAS 440 + Ultra-Pure Oil provided the best control in this experiment; BYI-2960, IKI-3106, and Mainspring were less effective. Frank evaluated efficacy of BAS 440, BYI-2960, Distance, IKI-3106, Mainspring, and Talus 70DF on tea scale crawlers infesting holly. No significant differences between treatments and Nontreated check was obtained probably because of high variance due to patchy scale distribution within plants (Table 53). Also unexpected precipitation occurred 3 hours after one application.

Table 51. Efficacy on Tea Scale on Japanese Camellia, (*Camellia japonica*), Braman, GA, 2015.

Treatment	Rate Per 100 Gal	Application Dates	Number of Crawlers Per 3 Leaves ^x				
			Pretreat	7 DAT ^y	14 DAT	28 DAT	6 MAT
Altus 200 SL	2.7 fl oz	5/20, 27, 6/3	3.87 abc	4.25 ab (12)	1.87 abc (0)	2.37 bc (31)	0.87 b (85)
Altus 200 SL	5.4 fl oz	5/20, 27, 6/3	9.25 a	7.00ab (39)	4.25 a (0)	0.25 c (97)	0.37 b (97)
Distance	12 fl oz	5/20, 6/10	3.37 bc	2.87 b (31)	4.00 a (0)	1.75 bc (41)	1.50 b (71)
Distance + Tristar	12 fl oz +12 fl oz	5/20	6.00 abc	5.12 ab (31)	2.37abc (9)	1.12 bc (79)	0.83 b (91)
IKI-3106	22 fl oz	5/20, 6/3	4.75 abc	6.25 ab (0)	1.12 bc (46)	2.12 bc (50)	0.50 b (93)
IKI-3106	28 fl oz	5/20	6.62 abc	3.62 ab (56)	1.12 bc (61)	1.25 bc (79)	0.62 b (94)
Mainspring 200SC	.125 fl oz/ft ht	5/20, 6/17	4.50 bc	5.75 ab (0)	1.62 abc (17)	4.00 ab (0)	0.33 b (95)
Mainspring 200SC	.25 fl oz/ft ht	5/20	3.87 bc	3.25 b (32)	2.25abc (0)	1.87 bc (46)	0.71 b (88)
Talus 70DF	14 oz	5/20	2.75 c	1.62 b (53)	0.25 c (79)	0.37 c (85)	0.57 b (87)
Ventigra	7 fl oz	5/20, 6/3, 17	4.87 abc	2.25 b (63)	0.25 c (88)	0.87 bc (80)	0.37 b (95)
UTC	-	-	7.75 ab	9.62 a (0)	3.37 ab (0)	6.87 a (0)	12.0 a (0)

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

^y DAT = days after the first treatment; MAT = months after first treatment.

* Mainspring applied as drench at 0.125 and 0.25 fl oz per foot shrub height.

Table 52. Efficacy on Tea Scale on Japanese Camellia, (*Camellia japonica*), Chen, LA, 2015.

Treatment	Rate (per 100 gal)	Number of Scales Per Leaf (Henderson's Percent Control) ^x					
		30 DAT	68 DAT	90 DAT	128 DAT	157 DAT	197 DAT
<i>Immatures</i>							
BAS440 + Ultra-Pure Oil	7 fl oz + 12 fl oz	0.3 a (70)	0 b (100)	0.4 c (67)	0.5 a (17)	1.0 b (55)	11.1 a (0)
Distance	12 fl oz	0.3 a (70)	3.2 b (76)	0.1 c (92)	0.1 a (83)	0.7 b (68)	1.3 a (0)
Distance + TriStar	12 fl oz + 12 fl oz	0.5 a (50)	0.1 b (99)	0.2 c (83)	0.3 a (50)	0.3 b (86)	0.4 a (0)
IKI-3106	22 fl oz	0.3 a (70)	0.3 b (98)	2.6 a (0)	1.3 a (0)	6.8 a (0)	11.0 a (0)
IKI-3106	28 fl oz	0.9 a (10)	2.5 b (81)	0.7 bc (42)	0.9 a (0)	2.3 b (0)	0.1 a (67)
Mainspring 200SC	8 fl oz	0.3 a (70)	0.5 b (96)	0.7 bc (42)	0.6 a (0)	2.7 b (0)	0.7 a (0)
Talus 70DF	14 oz	0 a (100)	0 b (100)	0 c (100)	0.5 a (17)	0.1 b (95)	1.2 a (0)
Ultra-Pure Oil	12 fl oz	0.3 a (70)	1.8 b (87)	2.0 ab (0)	2.25 a (0)	1.9 b (14)	1.5 a (0)
Nontreated	-	1.0 a (0)	13.4 a (0)	1.2 abc (0)	0.6 a (0)	2.2 b (0)	0.3 a (0)
<i>Adults</i>							
BAS440 + Ultra-Pure Oil	7 fl oz + 12 fl oz		0 b (100)	0.8 a (0)	0 b (100)	0.5 ab (44)	22.8 a (0)
Distance	12 fl oz		0.3 b (91)	0.7 a (0)	0.1 b (91)	0 b (100)	13.0 a (0)
Distance + TriStar	12 fl oz + 12 fl oz		0 b (100)	1.7 a (0)	0.1 b (91)	0.1 b (89)	20.4 a (0)
IKI-3106	22 fl oz		0 b (100)	0.1 a (86)	0.1 b (91)	1.9 a (0)	27.4 a (0)
IKI-3106	28 fl oz		0 b (100)	0.4 a (43)	0.2 b (82)	1.5 ab (0)	21.8 a (0)
Mainspring 200SC	8 fl oz		0 b (100)	0.1 a (86)	0 b (100)	0.9 ab (0)	30.4 a (0)
Talus 70DF	14 oz		0.1 b (97)	0 a (100)	0.1 b (91)	0 b (100)	45.7 a (0)
Ultra-Pure Oil	12 fl oz		0.1 b (97)	0.6 a (14)	5.3 a (0)	0.4 ab (56)	37.3 a (0)
Nontreated	-		3.2 a (0)	0.7 a (0)	1.1 b (0)	0.9 ab (0)	12.4 a (0)
<i>Total</i>							
BAS440 + Ultra-Pure Oil	7 fl oz + 12 fl oz		0 b (100)	1.2 a (37)	0.5 b (93)	1.5 b (52)	33.9 a (0)
Distance	12 fl oz		3.5 b (79)	0.8 a (58)	0.1 b (99)	0.7 b (77)	14.3 a (0)
Distance + TriStar	12 fl oz + 12 fl oz		0.1 b (99)	1.9 a (0)	0.4 b (94)	0.4 b (87)	20.8 a (0)

IKI-3106	22 fl oz		0.3 b (98)	2.7 a (0)	1.4 b (79)	8.6 a (0)	38.4 a (0)
IKI-3106	28 fl oz		2.5 b (85)	1.1 a (42)	1.1 ab (84)	3.7 b (0)	21.9 a (0)
Mainspring 200SC	8 fl oz		0.5 b (97)	0.8 a (58)	0.6 b (91)	3.6 b (0)	31.1 a (0)
Talus 70DF	14 oz		0.1 b (99)	0 a (100)	0.6 b (91)	0.1 b (97)	46.9 a (0)
Ultra-Pure Oil	12 fl oz		1.9 b (89)	2.6 a (0)	2.3 ab (66)	2.2 b (29)	38.8 a (0)
Nontreated	-		16.6 a (0)	1.9 a (0)	6.8 a (0)	3.1 b (0)	12.8 a (0)

^x Numbers on new growth at days after 1st application (DAT). Means within column followed by the same letter are not significantly different (LSD, P=0.05).

^y DAT = days after the first treatment; MAT = months after first treatment.

Table 53. Efficacy on Tea Scale on Holly (Ilex sp.) 'Nellie Stevens', Chong, SC, 2015.

Treatment	Rate (per 100 gal)	Application Dates	Number of Scales Per Square Inch Leaf Surface (Henderson's Percent Control) ^x						
			Pretreat	7 DAT ^y	14 DAT	21 DAT	28 DAT	4 MAT	6 MAT
BAS 440 + UltraPure Oil	7 fl oz + 1%	7/10, 24, 8/7	8.7 a	2.5 e (74)	1.0 c (89)	1.5 ef (85)	1.0 d (90)	1.2 cd (81)	1.0 a (84)
BYI-2960	2.7 fl oz	7/10, 17, 24	9.0 a	4.5 cde (54)	5.7 ab (41)	6.7 ab (37)	3.7 b (63)	3.3 ab (51)	2.0 a (69)
BYI-2960	5.4 fl oz	7/10, 17, 24	8.2 a	3.3 de (63)	4.5 b (49)	4.8 bc (50)	1.3 cd (86)	2.0 bc (67)	2.0 a (65)
Distance	12 fl oz	7/10, 31	9.3 a	3.2 e (69)	1.3 c (87)	1.2 f (89)	1.0 d (90)	1.0 cd (85)	1.5 a (77)
Distance + TriStar	12 + 12 fl oz	7/10, 31	8.8 a	3.5 de (64)	1.2 c (87)	1.2 f (88)	1.0 d (90)	1.0 cd (85)	1.3 a (79)
IKI-3106 + Capsil	22 + 6 fl oz	7/10, 24, 8/7	9.5 a	5.5 bc (47)	4.3 b (58)	3.7 cd (67)	1.5 bcd (86)	2.7 b (62)	1.3 a (81)
IKI-3106 + Capsil	28 + 6 fl oz	7/10, 24, 8/7	8.5 a	5.5 bcd (41)	3.5 b (62)	2.5 de (75)	1.2 cd (87)	1.7 bcd (73)	1.3 a (78)
Mainspring	8 fl oz	7/10, 8-7	10.9 a	7.2 ab (40)	7.8 a (34)	7.5 ab (42)	2.8 bc (77)	2.7 bcd (67)	1.5 a (81)
Talus 70DF	14 oz	7/10	8.5 a	3.3 e (65)	1.2 c (87)	1.2 f (88)	0.8 d (92)	0.8 d (87)	1.0 a (83)
Nontreated	-	-	8.5 a	9.3 a (0)	9.2 a (0)	10.0 a (0)	9.5 a (0)	6.3 a (0)	6.0 a (0)

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

^y DAT = days after the first treatment; MAT = months after first treatment.

* All treatments applied foliar, except Mainspring applied as drench to potting medium.

Table 54. Efficacy on Tea Scale on Holly (Ilex sp.), Frank, NC, 2015.

Treatment	Rate (per 100 gal)	Application Dates	Number of Scales Per 5 Leaves (Henderson's Percent Control) ^x			
			Pretreat	7 DAT ^y	14 DAT	28 DAT
BAS 440 00I	7 fl oz	10/20, 11/3	13.3 a	31.3 a (32)	34.5 a (15)	10.8 bc (55)
BYI-2960 200 S	2.7 fl oz	10/20, 11/3	7.3 a	7.0 a (72)	28.3 abc (0)	5.5 c (59)
BYI-2960 200 SL	5.4 fl oz	10/20, 11/3	5.3 a	21.5 a (0)	12.0 bc (25)	6.0 c (38)
Distance	12 fl oz	10/20	7.5 a	30.5 a (0)	16.0 abc (30)	20.8 a (0)
Distance + TriStar	12 + 12 fl oz	10/20	15.5 a	50.3 a (6)	31.8 a (32)	16.3 ab (42)
IKI-3106	22 fl oz	10/20, 11/3	8.5 a	39.0 a (0)	35.0 a (0)	10.8 bc (30)
IKI-3106	28 fl oz	10/20, 11/3	4.5 a	26.8 a (0)	10.5 c (23)	8.0 bc (2)
Mainspring 200SC	8 fl oz	10/20	12.0 a	31.0 a (25)	30.5 ab (16)	21.3 a (3)
Mainspring 200SC	12 fl oz	10/20	7.0 a	38.3 a (0)	11.5 bc (46)	12.0 abc (6)
Nontreated	-	-	6.75 a	23.3 a (0)	20.5 abc (0)	12.3 abc (0)

^x Means followed by same letter do not significantly differ (LSD test, P=0.05).

^y DAT = days after the first treatment.

* All treatments applied foliar, except Mainspring applied as drench to potting medium.

Wax Myrtle Scale

In 2008 and 2009, Chong conducted four experiments on armored scale (*Melanaspis deklei*) on wax myrtle (*Myrica cerifera*) to evaluate efficacy of neonicotinoids (Aloft, Flagship, Merit, Safari and TriStar), insect growth regulators (Distance and Talus) and other insecticides.

In three of the four experiments, no statistical differences were observed among treatments (Table 55 - Table 57). In two experiments, the comparatively low number of live scales on the Nontreated plants resulting from parasitoid activities might have confounded results of these experiments. In a 2009 test, all insecticides, Distance, Talus, Safari and paraffinic oil, significantly reduced armored scale population only by 6 weeks after treatment (Table 58). The management of *M. deklei* may require repeated applications of insecticides at the time of crawler emergence over a 2-3 year period. In 2014, Chong conducted another experiment to evaluate the efficacy of GF-2860/XXpire on armored scale (*Melanaspis deklei*) on wax myrtle (*Myrica cerifera*) (Table 59). Both GF-2860 and the standard paraffinic oil provided significant control of adults and nymphs at 14 DAT and for the rest of the growing season. Paraffinic oil was the most efficacious treatment, followed by GF-2860 at 2.75 and 3.5 oz/100 gal.

No phytotoxicity was observed on any of the treated wax myrtle shrubs.

Table 55. Efficacy on Wax Myrtle Scale on Wax Myrtle, Chong, SC, 2008a.

Treatment	Rate	Application Method, Timing	Population Averages (Henderson's Percent Control)				
			Pretreatment Counts	1 WAT	2 WAT	4 WAT	8 WAT
Aloft LC SC (clothianidin + bifenthrin)	5 fl oz per 100 gal	Sprenc, May	1.0 a	0.7 a (42)	2.9 a (0)	1.8 a (38)	0.9 a (0)
Aloft LC SC (clothianidin + bifenthrin)	10 fl oz per 100 gal	Sprenc, May	0.7 a	0.9 a (0)	1.2 a (33)	2.0 a (0)	1.5 a (0)
Flagship 25 WG (thiamethoxam)	8 oz per 100 gal	Foliar, May	0.4 a	0.7 a (0)	0.1 a (29)	1.7 a (0)	2.3 a (0)
Merit 2F (imidacloprid)	0.2 fl oz/in DBH	Drench, May	1.0 a	0.5 a (58)	0.2 a (80)	2.4 a (0)	1.9 a (0)
Orthene TTO (acephate)	8 oz per 100 gal	Foliar, May	1.2 a	1.6 a (0)	3.9 a (0)	4.8 a (0)	2.4 a (0)
Safari 20SG (dinotefuran)	12 g/in DBH	Drench, May	1.1 a	0.3 a (77)	0.5 a (17)	0.6 a (0)	0.1 a (67)
Safari 20SG (dinotefuran)	12 g/in DBH	Drench, July	0.8 a	1.0 a (0)	1.8 a (10)	2.5 a (0)	0.5 a (60)
Safari 20SG (dinotefuran) + PentraBark	12 g/in DBH	Drench, May	1.3 a	1.4 a (10)	2.4 a (14)	3.8 a (0)	6.4 a (0)
TriStar 30 SG (acetamiprid)	4 oz per 100 gal	Foliar, May	0.4 a	0.7 a (0)	0.5 a (64)	1.0 a (0)	2.6 a (0)
TriStar 30 SG (acetamiprid)	8 oz per 100 gal	Foliar, May	0.3 a	0.4 a (0)	0.2 a (75)	0.9 a (0)	0.6 a (0)
Nontreated	-	-	0.5 a	0.6 a (0)	1.2 a (0)	1.2 a (0)	0.6 a (0)

* Means within a column followed by the same letter are not significantly different based on data analysis using PROC GLM for completely randomized design with sub-sampling (SAS).

Table 56. Efficacy on Wax Myrtle Scale on Wax Myrtle, Chong, SC, 2008b.

Treatment	Rate	Application Method, Timing	Population Averages (Henderson's Percent Control)				
			Pretreatment Counts	1 WAT	2 WAT	4 WAT	8 WAT
Distance (pyriproxyfen)	12 fl oz/100 gal	Foliar, July	3.8 a	10.1 a (0)	3.8 a (0)	4.6 a (32)	45.5 a (37)
Safari 20 SG (dinotefuran)	8 oz/100 gal	Foliar, July	1.0 a	1.4 a(43)	0.8 a(0)	1.3 a(9)	28.2 a(0)
SunSpray Ultrafine	2% (2 gal/100 gal)	Foliar, July	3.4 a	7.3 a(13)	2.5 a(0)	1.4 a(68)	20.8 a(6)
Talus 40 SC (buprofezin)	21.5 fl oz/100 gal	Foliar, July	5.1 a	9.2 a (27)	4.5 a (0)	3.5 a (56)	29.5 a (47)
Nontreated	-	-	4.7 a	11.6 a(0)	2.7 a(0)	4.8 a(0)	75.7 a(0)

* Means within a column followed by the same letter are not significantly different based on data analysis using PROC GLM for completely randomized design with sub-sampling (SAS).

Table 57. Efficacy on Wax Myrtle Scale on Wax Myrtle, Chong, SC, 2009a.

Treatment	Rate	Application Method	Population Averages (Henderson's Percent Control)				
			Pretreatment Counts	1 WAT	2 WAT	4 WAT	8 WAT
Aloft LC SC (clothianidin + bifenthrin)	10 fl oz/100 gal	Sprench	1.6 a	0.6 a (0)	0.8 a (0)	3.2 a (14)	0.4 a (34)
Flagship 25 WG (thiamethoxam)	4 g/ft height	Drench	0.5 a	0.9 a (0)	0.2 a (83)	0.1 a (89)	0.2 a (0)
Flagship 0.22G (thiamethoxam)	227 g/ft height	Broadcast	10.1 a	0.6 a (81)	1.0 a (0)	15.7 a (0)	3.2 a (0)
Rycar (pyrifluquinazon)	18 fl oz/100 gal	Foliar	4.6 a	1.8 a (0)	1.6 a (33)	5.0 a (32)	0.4 a (58)
Orthene TTO (acephate)	8 oz/100 gal	Foliar	0.6 a	1.1 a (0)	2.0 a (0)	4.7 a (49)	3.1 a (0)
Safari 20SG (dinotefuran)	6 g/ft height	Drench	0.2 a	0.9 a (0)	0.3 a (75)	0.7 a (50)	0.2 a (0)
Safari 2G (dinotefuran)	60 g/ft height	Soil surface	3.2 a	0.7 a (31)	0.7 a (25)	0.5 a(85)	0 a (100)
TriStar 30 SG (acetamiprid) + Capsil	8 oz/100 gal + 6 fl oz/100 gal	Foliar	2.8 a	0.8 a (10)	0.6 a (44)	3.3 a (0)	1.3 a (0)
Nontreated	-	-	1.9 a	0.6 a (0)	0.8 a (0)	3.7 a (0)	0.7 a (0)

* Means within a column followed by the same letter are not significantly different based on data analysis using PROC GLM for completely randomized design with sub-sampling (SAS).

Table 58. Efficacy on Wax Myrtle Scale on Wax Myrtle, Chong, SC, 2009b.

Treatment	Rate	Application Method	Population Averages (Henderson's Percent Control)				
			Pretreatment Counts	1 WAT	2 WAT	4 WAT	8 WAT
Distance 10EC (pyriproxyfen)	12 fl oz/100 gal; twice 14 days apart	Foliar	3.0 a	3.6 a (42)	2.3 a (37)	2.7 a (0)	2.7 b (31)
Paraffinic oil	2 gal/100 gal	Foliar	2.1 a	2.5 a (58)	2.6 a (0)	3.6 a (0)	2.9 b (45)
Safari 20 SG (dinotefuran)	8 oz/100 gal	Foliar	4.5 a	12.2 a (0)	4.2 a (66)	3.1 a (0)	3.6 b (20)
Talus 40 SC (buprofezin)	21.5 fl oz/100 gal	Foliar	2.8 a	11.0 a (0)	5.6 a (50)	4.2 a (0)	4.1 b (33)
Nontreated	-	-	7.0 a	14.4 a (0)	14.6 a (0)	5.3 a (0)	7.7 a (0)

* Means within a column followed by the same letter are not significantly different based on data analysis using PROC GLM for completely randomized design with sub-sampling (SAS).

Table 59. Efficacy on Wax Myrtle Scale on Wax Myrtle, Chong, SC, 2014.

Treatment	Rate (per 100 gal)	Population Averages (Henderson's Percent Control) ^x				
		Pretreat	7 DAT ^y	13 DAT	27 DAT	6 MAT
GF-2860	2 oz	18.5 a	13.2 a (43)	7.8 ab (51)	6.2 b (59)	8.0 b (51)
GF-2860	2.75 oz	19.0 a	9.8 a (59)	5.3 b (67)	3.2 bc (79)	5.5 b (68)
GF-2860	3.5 oz	12.5 a	9.2 a (41)	4.5 b (58)	2.8 bc (73)	5.5 b (51)
Paraffin oil	2%	16.3 a	7.5 a (63)	2.7 b (81)	1.3 c (90)	3.8 b (74)
Nontreated	-	13.8 a	17.3 a (0)	11.8 a (0)	11.3 a (0)	12.3 a (0)

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

^y DAT = days after the first treatment; MAT = months after first treatment.

* Treatments applied foliar on 5/13 and 5/26; Capsil (at 6 fl oz/100 gal) was mixed in the solutions of GF-2860.

Winged Euonymus Scale

Freiberger. In 2004 and 2005, efficacy of several products and new active ingredients were tested in two experiments conducted at the Rutgers Cream Ridge Station for winged euonymus scale (*Lepidosaphes yanagicola*) on euonymus. In the 2004 experiment, treatments did not start exhibiting good efficacy until 27 DAT, but only Talus SC provided 100% control by 45 DAT (Table 60). Most of the systemic products had delayed efficacy similar to the growth regulators Talus and Distance. Kontos provided some efficacy in this experiment. In the 2005 experiment, none of the products performed better than 87% control with only Orthene and Flagship providing reasonable control throughout the experiment (Table 61). Talus did achieve the same level by the end of the experiment. Safari 20SG did not reduce mealybug populations either as a drench or foliar application.

Table 60. Efficacy on Winged Euonymus Scale on Euonymus, Freiberger, NJ, 2004.

Treatment	Rate	Population Averages (Henderson's Percent Control)				
		Pretreatment counts (6/28/04 & 6/30/04)	6 DAT	13 DAT	27 DAT	45 DAT
Diazinon	8.96 oz/100 gal	7.2	13.4 (13)	7.9 (28)	5.3 (71)	48.8 (38)
Distance 0.86E	8 fl oz/100 gal	14.5	30.4 (3)	22.9 (0)	20.6 (44)	72.1 (55)
Distance 0.86E	16 fl oz/100 gal	3.4	19.2 (0)	11.8 (0)	6.4 (26)	26.3 (30)
Distance 0.86E	32 fl oz/100 gal	12.5	32.1 (0)	14.9 (22)	7.2 (77)	19.4 (86)
Flagship 25 WG	2 oz/100 gal	9.7	15.4 (26)	11.1 (25)	11.5 (53)	113.1 (0)
Flagship 25 WG	4 oz/100 gal	32.4	30.6 (56)	13.3 (73)	14.7 (82)	80.0 (77)
Flagship 25 WG	8 oz/100 gal	31.9	47.3 (31)	23.1 (53)	22.8 (72)	105.0 (70)
Kontos *	20 fl oz/100 gal	18.7	26.9 (33)	7.8 (73)	6.3 (87)	58.8 (71)
Kontos *	40 fl oz/100 gal	7.3	10.8 (32)	7.1 (37)	9.6 (49)	97.0 (0)
Safari 20SG **	12 oz/100 gal	9.8	23.5 (0)	21.6 (0)	35.0 (0)	228.6 (0)
Safari 20SG **	24 oz/100 gal	3.4	11.5 (0)	17.2 (0)	20.8 (0)	80.5 (0)
Safari 20SG **	48 oz/100 gal	6.2	10.6 (20)	13.6 (0)	15.5 (1)	101.4 (0)
Talus 40 SC	21.5 fl oz/100 gal	8.8	20.2 (0)	20.4 (0)	12.4 (45)	25.9 (73)
Talus 40 SC	43 fl oz/100 gal	9.0	23.5 (0)	9.3 (33)	7.0 (69)	0.0 (100)
Talus 40 SC	86 fl oz/100 gal	15.4	29.3 (12)	10.7 (55)	5.6 (86)	0.7 (100)
TriStar 70WSP	32 g/100 gal	8.6	26.1 (0)	6.3 (53)	6.9 (68)	33.2 (65)
TriStar 70WSP	64 g/100 gal	9.8	17.0 (19)	12.0 (20)	12.7 (49)	18.3 (83)
TriStar 70WSP	128 g/100 gal	33.0	50.5 (29)	21.5 (58)	20.8 (75)	87.3 (76)
Nontreated Control	---	13.7	29.6 (0)	21.1 (0)	34.8 (0)	150.5 (0)

* Kontos (BYI-8330) was applied solely on 7/2/04.

** Safari SG was applied as foliar spray instead of drench.

Table 61. Efficacy on Euonymus Scale on Euonymus, Freiberger, NJ, 2005.

Treatment	Rate	Population Averages (Henderson's Percent Control)				
		Pretreatment Counts	7 DAT	15 DAT	29 DAT	44 DAT
Flagship	2 oz per 100 gal	21.2	25.9 (55)	36.7 (36)	20.7 (63)	22.6 (66)
Flagship	4 oz per 100 gal	25.4	16.6 (76)	22.8 (67)	9.1 (87)	15.6 (81)
Orthene TTO	8 oz per 100 gal	24.0	12.1 (81)	21.9 (66)	20.1 (69)	10.7 (86)
Safari drench	12 oz/acre	3.9	8.1 (24)	10.9 (0)	10.9 (0)	24.0 (0)
Safari drench	24 oz/acre	5.1	16.2 (0)	22.3 (0)	22.7 (0)	41.8 (0)
Safari foliar	4 oz per 100 gal	11.4	20.7 (32)	39.7 (0)	39.0 (0)	57.9 (0)
Safari foliar	8 oz per 100 gal	11.8	14.0 (56)	20.3 (36)	16.2 (48)	28.7 (23)
Talus 40SC	21.5 fl oz per 100 gal	5.3	13.8 (4)	8.6 (40)	2.1 (85)	4.7 (72)
TriStar 70WSP	112 g per 100 gal	20.3	24.1 (56)	30.6 (44)	33.8 (37)	29.5 (54)
TriStar 70WSP	224 g per 100 gal	16.1	14.7 (66)	41.5 (4)	59.8 (0)	42.3 (17)
Nontreated Control		16.2	43.6 (0)	43.5 (0)	43.1 (0)	51.0 (0)

* Note: outlier data point in Flagship 4 oz per 100 gallon rate was removed. This bush started with 348 scale in the initial count, an amount far greater than any other plant.

Comparative Efficacy on Cushion Scales

Cushion scale species are not as common as the other scale species tested in this program. They are a unique group, and, unlike other scale species, adults are able to move around. IR-4 conducted 5 experiments between 2005 and 2012 on one species.

Cottony Cushion Scale

Three researchers evaluated the efficacy of neonicotinoids (Flagship, Safari and TriStar), insect growth regulators (Distance and Talus), A16901B, GF-2626, XXpire, Kontos and Rycar on cottony cushion scale (*Icerya purchasi*). A test on cleyera (*Ternstroemia sp.*) had an extremely high scale population that caused early plant death in some treatments and the test was terminated early. No statistically significant differences were observed until 21 DAT; on this date, TriStar and Orthene provided good control (Table 62). Two experiments on heavenly bamboo (*Nandina domestica*) showed all treatments providing good to excellent control of nymphs and adults in 2011 (Table 63); Flagship, GF-2626, XXpire, and Distance provided good to excellent control of nymphs in 2012 (Table 64). In a 2011 experiment on pittosporum (*P. tobira*), all treatments except A16901B significantly reduced live nymphs (Table 65). Of the neonicotinoids, Safari performed the best with no difference in efficacy between the drench and broadcast applications. On the other hand, foliar sprays of Flagship appeared to perform slightly (though not significantly) better than broadcast application. For the insect growth regulators, Talus provided better efficacy than Distance. In a 2012 experiment on pittosporum, both rates of GF-2626 and XXpire, along with Distance, Talus 70DF, Safari G and paraffinic oil, significantly reduced the numbers of nymphs feeding on the leaves one week after treatment (Table 66). At 4 WAT, both rates of GF-2626 and XXpire, along with all other treatments except for Flagship G and Kontos, achieved significantly lower nymph densities. At this time, all treatments significantly reduced adult numbers on the leaves. However, none of the treatments were effective in reducing the numbers of nymphs and adults feeding on the stems (Data not shown, refer to researcher report).

No phytotoxicity was observed on any of the treated plants.

Table 62. Efficacy on Cottony Cushion Scale on Cleyera, Ludwig, TX, 2005.

Treatment	Rate	Population Averages (Henderson's Percent Control)			
		Pretreatment	9 DAT (Visual)	16 DAT (Visual)	21 DAT (Microscope)
Celero	4 oz	197.3 a	210.0 a (0)	210.5 a (0)	209.3 ab (48)
Safari 20SG	4 oz	156.5 a	97.5 a (42)	64.8 a (57)	100.8 a (69)
Safari 20SG	8 oz	170.0 a	158.5 a (13)	221.0 a (0)	259.3 a (26)
Safari 20SG – Drench	12 oz	101.0 a	155.7 a (0)	190.3 a (0)	346.7 a (0)
Safari 20SG – Drench	24 oz	190.8 a	216.3 a (0)	125.0 a (32)	205.5 ab (47)
TriStar 30SG	112 g	132.8 a	115.0 a (19)	84.0 a (34)	58.8 bc (78)
TriStar 30SG	124 oz	111.8 a	155.0 a (0)	121.5 a (0)	30.3 cd (87)
Orthene TTO 97	8 oz	403.0 a	330.0 a (23)	200.0 a (48)	80.0 d (90)
Nontreated	-	160.5 a	171.5 a (0)	154.0 a (0)	328.8 a (0)

* Letters after numbers are based on separation of average number of scale on 5 plants. See experiment report in Appendix 3 for statistical separation details.

Table 63. Efficacy on Cottony Cushion Scale on Heavenly Bamboo ‘Harbour Dwarf’, Frank, NC, 2011.

Stage	Treatment	Rate	Applic. Method	Population Averages (Henderson’s % Control)				
				Pretreat	7 DAT	14 DAT	28 DAT	75 DAT
Adults	A16901B	5 oz/100 gal	Drench	1.0 a	0.0 b (100)	0.3 b (97)	0.2 b (98)	0.7 b (86)
	Distance IGR	8 fl oz/100 gal	Foliar	0.3 a	0.0 b (100)	0.0 b (100)	0.0 b (100)	0.0 b (100)
	Flagship 0.22G	30 g/plant	Broadcast	0.7 a	0.0 b (100)	0.0 b (100)	0.0 b (100)	0.0 b (100)
	Flagship 25WG	0.5 g/plant	Drench	0.2 a	0.0 b (100)	0.3 b (86)	0.3 b (83)	0.2 b (80)
	Horticultural Oil	50 fl oz/100 gal	Foliar	1.0 a	0.3 b (94)	0.7 b (93)	0.3 b (97)	0.8 b (84)
	Kontos	3.4 fl oz/100 gal	Foliar	0.5 a	0.0 b (100)	0.3 b (94)	0.2 b (96)	0.3 b (88)
	Rycar 20SC	18 fl oz/100 gal	Foliar	0.5 a	0.0 b (100)	0.5 b (90)	0.3 b (93)	1.0 b (60)
	Safari 2G	2.6 g/plant	Broadcast	0.7 a	0.0 b (100)	0.0 b (100)	0.2 b (97)	0.0 b (100)
	Safari 20SG	24 oz/100 gal	Drench	1.0 a	0.2 b (96)	0.0 b (100)	0.0 b (100)	0.0 b (100)
	Talus 70DF	14 oz/100 gal	Foliar	0.5 a	0.5 b (80)	1.0 b (81)	0.0 b (100)	0.0 b (100)
	Tristar 30SG	8 oz/100 gal	Foliar	1.5 a	0.0 b (100)	0.0 b (100)	0.0 b (100)	0.0 b (100)
	Nontreated	-	-	0.7 a	3.5 a (0)	7.3 a (0)	6.3 a (0)	3.5 a (0)
Nymphs	A16901B	5 oz/100 gal	Drench	8.8a	1.5 b (89)	1.0 b (89)	1.2 b (89)	0.0 b (100)
	Distance IGR	8 fl oz/100 gal	Foliar	11.0 a	0.7 b (96)	0.3 b (98)	0.7 b (95)	0.0 b (100)
	Flagship 0.22G	30 g/plant	Broadcast	8.3 a	0.0 b (100)	0.0 b (100)	0.2 b (98)	0.0 b (100)
	Flagship 25WG	0.5 g/plant	Drench	10.7 a	1.2 b (92)	0.5 b (97)	0.8 b (94)	0.0 b (100)
	Horticultural Oil	50 fl oz/100 gal	Foliar	9.0 a	3.7 b (72)	3.0 b (81)	2.5 b (78)	0.0 b (100)
	Kontos	3.4 fl oz/100 gal	Foliar	8.7 a	1.5 b (88)	1.7 b (89)	1.2 b (89)	0.0 b (100)
	Rycar 20SC	18 fl oz/100 gal	Foliar	9.8 a	2.8 b (85)	2.2 b (87)	2.5 b (80)	0.0 b (100)
	Safari 2G	2.6 g/plant	Broadcast	11.0 a	0.3 b (98)	0.0 b (100)	0.0 b (100)	0.0 b (100)
	Safari 20SG	24 oz/100 gal	Drench	11.0 a	0.3 b (98)	0.2 b (99)	0.0 b (100)	0.0 b (100)
	Talus 70DF	14 oz/100 gal	Foliar	8.5 a	1.7 b (97)	0.7 b (95)	0.3 b (97)	0.0 b (100)
	Tristar 30SG	8 oz/100 gal	Foliar	9.5 a	0.0 b (100)	0.0 b (100)	0.0 b (100)	0.0 b (100)
	Nontreated	-	-	9.7 a	14.5 a (0)	16.7 a (0)	12.5 a (0)	1.3 a (0)

* Means within a column followed by the same letter are not significantly different (LSD test, P= 0.05).

Table 64. Efficacy of Insecticides on Cottony Cushion Scale on Heavenly Bamboo ‘Harbour Dwarf’, Frank, NC, 2012.

Scale Stage	Treatment*	Rate Per 100 Gal	Population Averages (Henderson’s Percent Control)				
			Pre	6 DAT	14 DAT	28 DAT	134 DAT
Nymphs	A16901B	5 fl oz	45.3 a	32.8 a (30)	25.2 a (49)	42.5 ab (70)	0.2 a
	A16901B	10 fl oz	45.2 a	43.3 a (21)	15.0 a (70)	50.5 ab (65)	0.0 a
	Distance	12 fl oz	34.2 a	29.7 a (28)	5.5 a (85)	22.5 b (79)	0.0 a
	Flagship G	40 g/pot	44.3 a	30.0 a (44)	15.8 a (84)	10.3 b (93)	0.0 a
	GF-2626 ISC	8 fl oz	51.8 a	38.5 a (38)	12.3 a (78)	0.0 b (100)	0.0 a
	GF-2626 ISC	11 fl oz	55.7 a	27.7 a (59)	1.2 a (98)	16.7 b (91)	0.2 a
	Xxpire 40WG	3.5 oz	49.8 a	9.7 a (84)	12.0 a (78)	2.0 b (99)	0.0 a
	Xxpire 40WG	7 oz	43.8 a	21 a (60)	4.8 a (90)	3.5 b (97)	0.0 a
	Horticultural Oil	150 fl oz	21.2 a	16.8 a (35)	4.2 a (82)	21.2 b (68)	0.0 a
	Kontos	3.4 fl oz	21.7 a	16.8 a (36)	19.7 a (18)	41.8 ab (39)	0.2 a
	Talus 70DF	14 fl oz	33.2 a	12.0 a (70)	30.8 a (16)	51.2 ab (51)	0.0 a
	Nontreated	-	25.7 a	31.0 a (0)	28.3 a (0)	81.2 a (0)	0.0 a
	Adults	A16901B	5 fl oz	2.0 a	2.2 a (4)	3.0 a (0)	4.5 ab (0)
A16901B		10 fl oz	5.0 a	4.0 a (51)	3.5 a (49)	3.7 ab (59)	0.0 a
Distance		12 fl oz	1.7 a	1.5 a (23)	1.2 a (98)	0.7 bc (77)	0.0 a
Flagship G		40 g/ pot	1.5 a	2.2 a (0)	2.2 a (0)	3.3 abc (0)	0.0 a
GF-2626 ISC		8 fl oz	1.5 a	1.0 a (42)	1.3 a (36)	0.7 bc (74)	0.0 a
GF-2626 ISC		11 fl oz	2.7 a	1.8 a (42)	3.3 a (10)	2.7 abc (45)	0.0 a
Xxpire 40WG		3.5 oz	7.0 a	4.2 a (48)	4.7 a (51)	2.3 abc (82)	0.0 a
Xxpire 40WG		7 oz	2.3 a	2.0 a (24)	2.3 a (27)	0.5 c (88)	0.0 a
Horticultural Oil		150 fl oz	2.3 a	2.5 a (6)	3.2 a (0)	2.2 bc (47)	0.0 a
Kontos		3.4 fl oz	2.2 a	2.0 a (21)	2.8 a (7)	2.0 bc (50)	0.0 a
Talus 70DF		14 fl oz	2.5 a	3.2 a (0)	4.0 a (0)	4.0 abc (12)	0.2 a
Nontreated		-	3.3 a	3.8 a (0)	4.5 a (0)	6.0 a (0)	0.0 a

^x Numbers of live nymphs or adults per plant counted days after initial treatment. Means within column followed by the same letter are not significantly different (LSD, P=0.05).

* A16901B applied as drench, Flagship as soil broadcast, and the other products as foliar treatments.

Table 65. Efficacy on Cottony Cushion Scale on *Pittosporum* ‘Variegata’, Chong, SC, 2011.

Treatment	Rate	Applic. Method	Number of Nymphs (Henderson's % Control)				
			Pretreat	1 WAT	2 WAT	4 WAT	6 WAT
A16901B	10 oz/100 gal	Drench	19.7 a	19.8 a (0)	19.2 a (0)	20.0 a (0)	20.2 a (0)
Distance IGR	12 fl oz/100 gal	Foliar	20.7 a	11.0 bc (41)	9.5 b (50)	3.7 b (81)	2.8 bc (86)
Flagship 25WG	8 oz/100 gal	Foliar	18.5 a	2.7 de (84)	2.2 d (87)	2.5 b (86)	1.8 bc (90)
Flagship 0.22G	227 g/ft ht	Broadcast	20.7 a	8.0 cd (57)	8.8 bc (53)	3.7 b (81)	4.3 b (78)
Kontos	3.4 fl oz/100gal	Foliar	17.8 a	7.8 cd (77)	6.8 bc (58)	0.2 b (99)	0 d (100)
Rycar 20SC	18 fl oz/100 gal	Foliar	20.8 a	10.8 b (42)	4.8 bcd (75)	1.7 b (91)	0.3 d (98)
Orthene TTO97	8 oz/100 gal	Foliar	19.7 a	5.8 cde (67)	6.0 bc (67)	3.8 b (80)	3.8 bc (79)
Safari 20SG	6 g/ft ht	Drench	19.7 a	2.2 de (88)	1.2 d (93)	0 b (100)	0 d (100)
Safari 2G	60 g/ft ht	Broadcast	18.7 a	0.7 e (96)	0.8 d (95)	0 b (100)	0 d (100)
Talus70 DF	14 oz/100 gal	Foliar	17.7 a	4.0 de (75)	1.3 d (92)	0.2 b (99)	0 d (100)
TriStar 30 SG	8 oz/100 gal	Foliar	16.5 a	2.5 de (83)	3.0 c (80)	0.8 b (95)	0.5 cd (97)
Nontreated	-	-	19.0 a	17.0 ab (0)	17.3 a (0)	18.0 a (0)	17.8 a (0)

* ANOVA for Completely Randomized Design at $\alpha = 0.05$. Means within a column with the same letters are not significantly different among the treatments by LSD.

Table 66. Efficacy on Cottony Cushion Scale on *Pittosporum* ‘Variegata’, Chong, SC, 2012.

Scale Stage	Treatment	Rate	Applic Method	Mean No. Per 3 Leaves (Henderson's % Control)					
				0 DAT	1 WAT	2 WAT	4 WAT	6 WAT	6 MAT
Nymphs	A16901B	5 oz/100 gal	Drench	17.5 a	15.5 ab (25)	72.7 a (0)	25.3 bc (40)	39.7 ab (0)	12.7 a (0)
	A16901B	10 oz/100 gal	Drench	24.7 a	14.2 ab (51)	41.0 a (18)	15.7 c (74)	35.2 abc (0)	21.7 a (0)
	Distance	12 fl oz/100 gal	Foliar	23.0 a	11.8 b (57)	47.0 a (0)	20.5 bc (63)	15.2 cd (0)	17.3 a (0)
	Flagship G	60 g/plant	Broadcast	69.5 a	28.2 a (66)	79.5 a (44)	44.0 ab (74)	20.7 bcd (51)	11.0 a (76)
	GF-2626 1SC	8 fl oz/100 gal	Foliar	24.2 a	10.2 b (64)	37.7 a (23)	7.3 c (87)	12.7 d (14)	7.0 a (57)
	GF-2626 1SC	11 fl oz/100 gal	Foliar	19.3 a	5.0 b (78)	31.3 a (20)	4.2 c (91)	11.7 d (1)	16.8 a (0)
	Xxpire 40WG	3.5 oz/100 gal	Foliar	35.2 a	10.2 b (75)	26.7 a (63)	7.2 c (91)	15.0 cd (31)	8.5 a (64)
	Xxpire 40WG	7 oz/100 gal	Foliar	24.8 a	6.3 b (78)	29.8 a (41)	9.7 c (84)	6.5 d (57)	8.2 a (50)
	Kontos	3.4 fl oz/100 gal	Drench	32.0 a	16.2 ab (57)	59.8 a (8)	54.3 a (29)	37.7 ab (0)	23.8 a (0)
	Paraffinic oil	2% v/v	Foliar	30.8 a	8.2 b (77)	30.0 a (52)	26.2 bc (65)	11.8 d (38)	11.2 a (45)
	Safari 2G	2.6 g/gal pot	Broadcast	23.3 a	8.8 b (68)	27.0 a (43)	22.2 bc (60)	44.8 a (0)	22.2 a (0)
	Talus 70DF	14 oz/100 gal	Foliar	11.5 a	8.0 b (41)	27.2 a (0)	15.2 c (45)	6.0 d (15)	16.2 a (0)
	Nontreated	-	-	23.3 a	27.5 a (0)	47.3 a (0)	56.0 a (0)	14.3 cd (0)	15.5 a (0)
	Adults	A16901B	5 oz/100 gal	Drench	0.7 a	0.3 a (98)	0.5 a (93)	0.7 cd (97)	1.5 b (57)
A16901B		10 oz/100 gal	Drench	2.3 a	2.0 a (96)	0.3 a (97)	0.5 cd (99)	1.0 b (91)	0.8 a (91)
Distance		12 fl oz/100 gal	Foliar	0.8 a	2.8 a (82)	1.7 a (47)	3.0 bc (89)	4.8 a (0)	0.2 a (94)
Flagship G		60 g/plant	Broadcast	5.8 a	9.7 a (92)	1.2 a (95)	0.7 cd (100)	1.2 b (96)	0 a (100)
GF-2626 1SC		8 fl oz/100 gal	Foliar	1.5 a	2.5 a (92)	0.2 a (93)	0 d (100)	0.5 b (93)	0.3 a (95)
GF-2626 1SC		11 fl oz/100 gal	Foliar	1.7 a	5.3 a (84)	0 a (100)	0.2 d (100)	0.3 b (96)	0 a (100)
Xxpire 40WG		3.5 oz/100 gal	Foliar	4.2 a	1.0 a (99)	0.2 a (99)	0.2 d (100)	0.5 b (98)	0.3 a (98)
Xxpire 40WG		7 oz/100 gal	Foliar	1.5 a	3.2 a (89)	0.7 a (95)	0.3 d (99)	0.5 b (93)	0.3 a (95)
Kontos		3.4 fl oz/100 gal	Drench	1.7 a	3.5 a (90)	1.5 a (78)	4.0 b (93)	1.8 b (79)	0.7 a (90)
Paraffinic oil		2% v/v	Foliar	2.5 a	2.7 a (95)	1.2 a (88)	1.8 bcd (98)	2.2 b (82)	0.5 a (95)
Safari 2G		2.6 g/gal pot	Broadcast	1.8 a	2.8 a (95)	0.2 a (97)	1.0 cd (98)	1.8 b (82)	0.7 a (90)
Talus 70DF		14 oz/100 gal	Foliar	1.2 a	7.0 a (71)	1.6 a (67)	0.5 cd (99)	0.4 b (93)	2.2 a (54)
Nontreated		-	-	0.2 a	4.0 a (0)	0.8 a (0)	6.7 a (0)	1.0 b (0)	0.8 a (0)

* Means within a column followed by the same letter are not significantly different (LSD test, P= 0.05).

Comparative Efficacy on Felt Scales

Felt scales (insect family Eriococcidae) have a felt-like covering most noticeable when adults are producing eggs. Three experiments were conducted during 2018 through 2020 on crapemyrtle bark scale.

Crapemyrtle Bark Scale.

In 2018, Vafaie conducted an experiment examining efficacy of various products on crapemyrtle bark scale (*Acanthococcus lagerstroemiae*) infesting crapemyrtles (*Lagerstroemia* sp.). Although the data had too much variability to provide reliable results, the researcher's preliminary conclusions demonstrate reliable scale suppression with Distance, Safari, Talus, and Altus at 10.5 fl oz/100 gal (Table 67, Table 68). Further work is needed to determine efficacy of Cyclaniliprole at 22 fl oz/100 gal. No phytotoxicity was observed on any of the treated plants.

In 2020, Held conducted an experiment examining efficacy of various products on crapemyrtle bark scale (*Acanthococcus lagerstroemiae*) infesting crapemyrtles (*Lagerstroemia* sp.). RTSA-721 and Transtect were applied on June 18 but pretreatment counts were not collected so Henderson-Tilton percent control was not able to be calculated. However, both RTSA-721 and Transtect treatments provided excellent efficacy throughout the experiment. ISM 555 provided good efficacy; all other treatments were ineffective (Table 69). No phytotoxicity was observed on any of the treated plants.

In 2021, Held studied impact of seven active ingredients on crapemyrtle bark scale (*Acanthococcus lagerstroemiae*) infesting crapemyrtles (*Lagerstroemia* sp.). RTSA-721 and Transtect were applied at day 3 but pretreatment counts were not collected so Henderson-Tilton percent control was not able to be calculated. However, Transtect treatments provided excellent efficacy throughout the experiment, similar to the experiment in 2020, but RTSA-721 was not as effective. ISM-555 provided excellent efficacy of crawlers and adults starting at day 29 and through day 90. The other treatments were not effective (Table 71).

Table 67. Efficacy on Crapemyrtle Bark Scale Crawlers on Crapemyrtles (*Lagerstroemia* sp.) ‘Natchez’, Vafaie, TX, 2018.

Median Number of Crawlers									
Treatment	Rate Per 100 Gal	Applic. Dates	Pretrt	2 WAT	4 WAT	6 WAT	10 WAT	15 WAT	20 WAT
Altus (flupyradifurone)	10.5 fl oz	May 11; May 25	0.02	0.38	0	0	0.02	0.15	0.04
	14 fl oz	May 11; May 25	2.31	0.51	0	0	0	0.15	0.25
AzaGuard (azadirachtin)	16 fl oz	May 11; May 25	0.02	0.31	0.1	0	0.51	4.56	0.92
	32 fl oz	May 11; May 25	0.02	0.34	0.02	0.03	0.32	5.89	2.15
Cyclaniliprole (cyclaniliprole)	22 fl oz	May 11, 25; Jun 8	0.02	0.12	0.08	0.02	0.25	0.67	2.2
	28 fl oz	May 11, 25; Jun 8	0	0.25	0	0	0	0.74	0.24
Distance (pyriproxyfen)	12 fl oz	May 11; Jun 1	0	0.4	0	0	0	0.04*	0
IKI-3326 SL ((cyclaniliprole + flonicamid)	12 oz	May 11, 25; Jun 8	0	0.15	0	0	0	1.64	0.93
	16.5 oz	May 11, 25; Jun 8	0	0.68	0.02	0	0.09	1.78	1.19
Safari (dinotefuran)	8 oz	May 11	0	0	0	0	0.03	0.18	0.21
Talus 70DF (buprofezin)	14 oz	May 11; May 25	0	0	0	0	0	0.09	0.04
Ventigra (afidopyropen) + Ultra Pure Oil	4.8 fl oz	May 11; May 25	0	0	0	0	0.02	0.25	0.12
	7 fl oz	May 11; May 25	0	0.06	0.01	0	0.04	1.29	0.15
Nontreated	-	-	0	0.21	0	0.01	0.07	4.27	0.57
Maximum Number of Crawlers									
Treatment	Rate Per 100 Gal	Applic. Dates	Pretrt	2 WAT	4 WAT	6 WAT	10 WAT	15 WAT	20 WAT
Altus (flupyradifurone)	10.5 fl oz	May 11; May 25	4.51	1.26	0.07	0.03	0.08	0.73	0.25
	14 fl oz	May 11; May 25	17.7	3.41	0	0	0.12	6.11	0.42
AzaGuard (azadirachtin)	16 fl oz	May 11; May 25	3.71	1.17	0.42	0.08	7.44	17.5	11.5
	32 fl oz	May 11; May 25	1.27	0.82	0.14	0.09	1.7	11.7	4.08
Cyclaniliprole (cyclaniliprole)	22 fl oz	May 11, 25; Jun 8	1.23	2.75	0.52	0.26	0.79	4.83	4.93
	28 fl oz	May 11, 25; Jun 8	0.75	1.07	0.2	0.06	0.13	11.8	2.29
Distance (pyriproxyfen)	12 fl oz	May 11; Jun 1	0.38	2.81	0.16	0	0.08	0.08*	0.1
IKI-3326 SL ((cyclaniliprole + flonicamid)	12 oz	May 11, 25; Jun 8	0.72	1.42	0.18	0.06	1.8	7.46	5.63
	16.5 oz	May 11, 25; Jun 8	0.69	1.61	0.46	0.06	0.29	5.27	2.53
Safari (dinotefuran)	8 oz	May 11	0.43	0.65	0	0	0.11	1.64	0.4
Talus 70DF (buprofezin)	14 oz	May 11; May 25	0.67	0.38	0	0.05	0.03	1.43	0.26
Ventigra (afidopyropen) + Ultra Pure Oil	4.8 fl oz	May 11; May 25	0.46	2.82	0.77	0.34	3.36	40.7	4.37
	7 fl oz	May 11; May 25	0.61	4.8	0.09	0.27	2.61	19.3	5.56
Nontreated	-	-	0.2	1.1	0.09	0.36	1.89	20.3	4.15

* Significantly different from the Nontreated check within the same column using a Dunn with Control for Joint Ranks (non-parametric).

** Significantly different from the Nontreated check within the same column using a Dunn with Control/ Statistics performed on log-transformed data (log(x+1)).

Table 68. Efficacy on CMBS Male Pupae and Egg Sacs on Crapemyrtles (*Lagerstroemia* sp.) ‘Natchez’, Vafaie, TX, 2018.

Mean Number of Male Pupae									
Treatment	Rate Per 100 Gal	Applic. Dates	Pretrt	1 WAT	3 WAT	4 WAT	6 WAT	9 WAT	20 WAT
Altus (flupyradifurone)	10.5 fl oz	May 11; May 25	0.33	0	0	0	0.17	0.17**	0**
	14 fl oz	May 11; May 25	2	0	0	0.33	0	1.17	17
AzaGuard (azadirachtin)	16 fl oz	May 11; May 25	0.5	0	0.5	6.17	4	4.33	21
	32 fl oz	May 11; May 25	0.33	0	0	0.33	2	2.33	2.67
Cyclaniliprole (cyclaniliprole)	22 fl oz	May 11, 25; Jun 8	0.5	0	0	1.5	1.33	15.7	0.17**
	28 fl oz	May 11, 25; Jun 8	0	0	0	0.17	0.83	15.2	8
Distance (pyriproxyfen)	12 fl oz	May 11; Jun 1	0.17	0	0	0.33	0.83	0**	0**
IKI-3326 SL ((cyclaniliprole + flonicamid)	12 oz	May 11, 25; Jun 8	0.33	0	0	0	0	0**	7
	16.5 oz	May 11, 25; Jun 8	0.17	0	0	0.33	4	10.3	5
Safari (dinotefuran)	8 oz	May 11	0.17	0	0	0	0	0**	0.67
Talus 70DF (buprofezin)	14 oz	May 11; May 25	0.67	0	0.17	0.17	0.33	0	0**
Ventigra (afidopyropen) + Ultra Pure Oil	4.8 fl oz	May 11; May 25	0	0	0.33	4.83	4.67	18.3	18.3
	7 fl oz	May 11; May 25	1.83	0	0.33	2.17	2.5	7.83	33.3
Nontreated	-	-	1	0	1	0.17	2.83	56.7	47.3
Mean Number of Egg Sacs									
Treatment	Rate Per 100 Gal	Applic. Dates	Pretrt	1 WAT	3 WAT	4 WAT	6 WAT	9 WAT	20 WAT
Altus (flupyradifurone)	10.5 fl oz	May 11; May 25	2.67	2.67	0.67	0.17	0.17**	0.67	0.5
	14 fl oz	May 11; May 25	6.67	2	0.83	0**	0.83	1.33	4
AzaGuard (azadirachtin)	16 fl oz	May 11; May 25	2	1.83	0.83	0.33	9.83	16	51.5
	32 fl oz	May 11; May 25	1.67	1.83	1.33	0.83	5.33	11	41.3
Cyclaniliprole (cyclaniliprole)	22 fl oz	May 11, 25; Jun 8	2.83	2.5	1	1.17	3.33	6	12.7
	28 fl oz	May 11, 25; Jun 8	3.5	1	0.17	0.17	2.17	5.17	21.8
Distance (pyriproxyfen)	12 fl oz	May 11; Jun 1	1.5	1.5	1.67	1	0.5	0.17	0.17
IKI-3326 SL ((cyclaniliprole + flonicamid)	12 oz	May 11, 25; Jun 8	1.83	0.83	0.5	0.33	1	4	19
	16.5 oz	May 11, 25; Jun 8	0.33	1.33	0.67	0.5	3.83	9.83	16.5
Safari (dinotefuran)	8 oz	May 11	1.17	0.5	0.17	0**	0**	0.17	4.83
Talus 70DF (buprofezin)	14 oz	May 11; May 25	3	1.83	0.33	0.17	0.17**	0**	0.17
Ventigra (afidopyropen) + Ultra Pure Oil	4.8 fl oz	May 11; May 25	1	0.83	0.67	0.17	6.83	6.83	28.5
	7 fl oz	May 11; May 25	3.5	1	0.67	0.5	5.33	11.2	37.3
Nontreated	-	-	2	0.83	0	4.5	14	6.5	23.3

* Significantly different from the Nontreated check within the same column using a Dunn with Control for Joint Ranks (non-parametric).

** Significantly different from the Nontreated check within the same column using a Dunn with Control/ Statistics performed on log-transformed data (log(x+1)).

Table 69. Efficacy on Crapemyrtle Bark Scale Crawlers and Adults on Crapemyrtles (*Lagerstroemia* sp.), Held, AL, 2020.

Mean number of CMBS Crawlers ^x							
Treatment	Rate Per 100 Gal	Pretreat (July 9)	July 13	July 16	July 23	Aug 6	Oct 3
BW133	5 lb	13.4 abc	16.6 c (3)	20.2 bc (0)	41.4 a (0)	5.2 b (85)	126.6 cd (0)
BW 238 ES	2 qt	12.4 abc	112.8 a (0)	91.6 a (0)	42.8 a (0)	106.8 a (0)	108.2 cd (0)
BW238 WP	2 lb	28.4 a	38.2 bc (0)	23.6 bc (0)	28.6 abc (0)	11.4 b (85)	225.4 ab (0)
ISM-555+ Capsil	3.84 fl oz	24.2 ab	12.4 c (60)	1.2 c (93)	6.0 cd (69)	0.0 b (100)	0.6 e (100)
MBI-203	128 fl oz	6.6 bc	87.8 ab (0)	48.8 b (0)	29.2 abc (0)	19.6 b (0)	289.0 a (0)
MBI-306	5 fl oz	28.2 a	42.0 bc (0)	10.2 c (48)	8.6 bcd (62)	19.8 b (74)	81.4 de (63)
RTSA-721	Drench 10 ml/ft shrub ht	0.0 c	0.0 c (na)	0.0 c (na)	0.0 d (na)	0.0 b (na)	1.2 e (na)
RTSA-721	Drench 5 ml/ft shrub ht	0.0 c	0.3 c (na)	0.2 c (na)	0.3 d (na)	1.2 b (na)	2.3 e (na)
SP3014 + Capsil	13 fl oz	18.4 abc	21.2 c (10)	17.8 bc (0)	33.4 ab (0)	3.8 b (92)	193.8 abc (0)
V-10433	Drench 11 fl oz	14.0 abc	27.4 c (0)	9.0 c (7)	4.2 cd (62)	35.4 b (6)	136.6 bcd (0)
Transtect 70 WSP	1 pack/ft shrub ht	0.0 c	0.0 c (na)	0.0 c (na)	0.0 d (na)	0.5 b (na)	0.0 e (na)
Nontreated	-	14.5 abc	18.5 c (0)	10.0 c (0)	11.5 bcd (0)	38.8 b (0)	114.7 cd (0)
Mean number of CMBS Adults ^x							
Treatment	Rate Per 100 Gal	Pretreat (July 9)	July 13	July 16	July 23	Aug 6	Oct 3
BW133	5 lb	18.2 ab	3.4 bc (87)	2.4 cde (86)	9.0 c (26)	10.0 c (86)	68.2 bcd (46)
BW 238 ES	2 qt	20.2 ab	26.8 a (7)	21.0 b (0)	7.6 c (43)	160.8 a (0)	81.6 bcd (42)
BW238 WP	2 lb	20.4 a	24.4 a (16)	21.4 ab (0)	15.8 bc (0)	63.4 bc (21)	87.8 bc (38)
ISM-555+ Capsil	3.84 fl oz	19.4 ab	18.8 ab (32)	11.0 b-e (41)	17.2 bc (0)	0.8 c (99)	14.6 cd (89)
MBI-203	128 fl oz	23.8 a	19.2 ab (43)	33.6 a (0)	37.8 ab (0)	106.0 ab (0)	119.4 b (28)
MBI-306	5 fl oz	16.6 ab	18.6 ab (21)	21.8 ab (0)	45.4 a (0)	30.0 bc (54)	273.2 a (0)
RTSA-721	Drench 10 ml/ft shrub ht	0.0 c	0.2 c (na)	0.7 e (na)	1.2 c (na)	0.5 c (na)	0.3 d (na)
RTSA-721	Drench 5 ml/ft shrub ht	0.7 c	0.8 c (20)	1.2 de (0)	1.5 c (0)	1.5 c (45)	8.3 cd (0)
SP3014 + Capsil	13 fl oz	22.6 a	21.0 a (35)	10.2 b-e (53)	19.0 bc (0)	44.8 bc (49)	63.2 bcd (60)
V-10433	Drench 11 fl oz	23.2 a	21.8 a (34)	13.8 bc (38)	8.2 c (47)	51.8 bc (43)	49.0 bcd (70)
Transtect 70 WSP	1 pack/ft shrub ht	0.0 c	0.0 c (na)	0.0 e (na)	0.0 c (na)	0.0 c (na)	0.0 d (na)
Nontreated	-	12.5 b	17.8 ab (0)	12.0 bcd (0)	8.3 c (0)	49.0 bc (0)	86.7 bc (0)

^x The letters within each column followed by the same letter were not significantly different (LSD, $P < 0.05$).

Table 70. Efficacy on Crapemyrtle Bark Scale Total Population on Crapemyrtles (*Lagerstroemia* sp.), Held, AL, 2020.

Mean Total number of CMBS ^x							
Treatment	Rate Per 100 Gal	Pretreat (July 9)	July 13	July 16	July 23	Aug 6	Oct 3
BW133	5 lb	31.6 ab	20.0 c (53)	22.6 cd (12)	50.4 abc (0)	15.2 b (85)	194.8 c (17)
BW238 ES	2 qt	32.6 ab	139.6 a (0)	112.6 a (0)	50.4 abc (0)	267.6 a (0)	189.8 c (22)
BW238 WP	2 lb	48.8 a	62.6 bc (5)	45.0 bc (0)	44.4 abc (0)	74.8 b (53)	313.2 abc (14)
ISM-555+ Capsil	3.84 fl oz	43.6 ab	31.2 c (47)	12.2 cd (66)	23.2 bcd (27)	0.8 b (99)	15.2 d (95)
MBI-203	128 fl oz	30.4 ab	107.0 ab (0)	82.4 ab (0)	67.0 a (0)	125.6 b (0)	408.4 a (0)
MBI-306	5 fl oz	44.8 ab	60.6 bc (0)	32.0 cd (12)	54.0 ab (0)	49.8 b (66)	354.6 ab (0)
RTSA-721	Drench 10 ml/ft shrub ht	0.0 c	0.2 c (na)	0.7 d (na)	1.2 d (na)	0.5 b (na)	1.5 d (na)
RTSA-721	Drench 5 ml/ft shrub ht	0.7 c	1.2 c (na)	1.3 d (na)	1.8 d (na)	2.7 b (na)	10.7 d (na)
SP3014+Capsil	13 fl oz	41.0 ab	42.2 bc (23)	28.0 cd (16)	52.4 abc (0)	48.6 b (64)	257.0 bc (16)
V-10433	Drench 11 fl oz	37.2 ab	49.2 bc (2)	22.8 cd (25)	12.4 cd (55)	87.2 b (28)	185.6 c (33)
Transtect 70 WSP	1 pack/ft shrub ht	0.0 c	0.0 c (na)	0.0 d (na)	0.0 d (na)	0.5 b (na)	0.0 d (na)
Nontreated	-	27.0 b	36.3 c (0)	22.0 cd (0)	19.8 bcd (0)	87.8 b (0)	201.3 c (0)

^x The letters within each column followed by the same letter were not significantly different (LSD, $P < 0.05$).

Table 71. Efficacy on Crapemyrtle Bark Scale Crawlers and Adults on Crapemyrtles (*Lagerstroemia* sp.), Held, AL, 2021.

Mean number of CMBS Crawlers ^x (Henderson's Percnet Control)							
Treatment	Rate Per 100 Gal	Day 0	Day 3	Day 7	Day 14	Day 28	Day 90
ISM-555+ Capsil@0.05%	3.84 fl oz	195.8 a	149.0 a (0)	92.8 cd (5)	16.2 d (24)	5.2 c (97)	8.2 d (98)
	5.76 fl oz	239.0 a	182.6 a (0)	32.4 d (73)	7.0 d (73)	5.8 c (97)	0.8 d (100)
MBI-203 SC2	128 fl oz	184.0 a	74.0 a (26)	76.0 cd (17)	17.8 d (11)	90.8 c (44)	376.6 abc (5)
MBI-306	2.5 fl oz	207.8 a	187.2 a (0)	106.4 bcd (0)	85.0 a (0)	189.4 bc (0)	704.4 a (0)
RTSA-721	10 ml/ ft shrub ht		110.2 bc	30.0 bcd	3.8 c	78.2 cd	
	2.5 ml/ft shrub ht		168.8 ab	30.0 bcd	5.5 c	364.5 abc	
SP3014+Capsil@0.05%	13 fl oz	237.4 a	182.8 a (0)	129.8 ab (0)	67.2 ab (0)	72.6 c (65)	278.8 bcd (46)
	26 fl oz	186.0 a	201.4 a (0)	93.0 cd (0)	95.8 a (0)	27.8 c (83)	176.0 cd (56)
V-10433	11 fl oz	237.4 a	203.8 a (0)	191.4 a (0)	64.8 abc (0)	214.8 ab (0)	560.2 ab (0)
Transtect 70 WSP	1 packet/3750ml water		37.3 d	21.2 d	0.5 c	0.0 d	
Nontreated	-	244.5 a	132.3 a (0)	122.2 ab (0)	26.7 cd (0)	215.0 a (0)	527.0 ab (0)
Mean number of CMBS Adults ^x (Henderson's Percnet Control)							
Treatment	Rate Per 100 Gal	Day 0	Day 3	Day 7	Day 14	Day 28	Day 90
ISM-555+ Capsil@0.05%	3.84 fl oz	46.4 a	50.4 a (0)	50.6 abcd (0)	21.2 bc (1)	10.0 c (8)	2.4 c (84)
	5.76 fl oz	98.6 a	74.0 a (3)	58.8 abc (32)	33.6 abc (26)	26.4 bc (0)	1.4 c (96)
MBI-203 SC2	128 fl oz	37.2 a	31.8 a (0)	35.4 bcde (0)	29.4 bc (0)	27.6 bc (0)	9.6 bc (19)
MBI-306	2.5 fl oz	96.6 a	48.0 a (36)	40.2 abcd (52)	48.4 ab (0)	85.0 a (0)	10.4 bc (66)
RTSA-721	10 ml/ ft shrub ht		16.8 de	54.3 ab	27.3 bc	2.5 c	
	2.5 ml/ft shrub ht		24.7 cde	18.2 bc	27.7 bc	4.3 c	
SP3014+Capsil@0.05%	13 fl oz	55.6 a	72.8 a (0)	78.0 a (0)	52.4 ab (0)	11.4 c (12)	20.0 ab (0)
	26 fl oz	56.2 a	41.8 a (4)	44.6 abcd (9)	49.0 ab (0)	29.0 bc (0)	4.8 c (73)
V-10433	11 fl oz	59.8 a	72.6 a (0)	66.8 ab (0)	71.2 a (0)	54.0 b (0)	4.6 c (76)
Transtect 70 WSP	1 packet/3750ml water		2.0 e	5.0 c	0.5 c	0.0 c	
Nontreated	-	69.8 a	53.8 a (0)	61.0 ab (0)	32.2 abc (0)	16.3 c (0)	22.3 a (0)

^x The letters within each column followed by the same letter were not significantly different (LSD, $P < 0.05$).

Comparative Efficacy on Lac Scales

Lac scale species (insect family Kerriidae) are not as common as the other scale species tested in this program. The lobate lac scale has recently been identified as a pest in Florida and Hawaii. However, there is a potential for the spread of this insect into other areas that are climatologically similar, like California, especially when plant materials are moved out of these infested states. Lobate lac scale has been found feeding on both native and non-native plant species in Florida and Hawaii.

One experiment has been conducted so far on lobate lac scale.

Lobate Lac Scale

Cheng evaluated the efficacy of several products applied foliar on lobate lac scale (*Paratrichodorus pseudolabata*) on hibiscus (*Hibiscus rosa-sinensis*) in 2018. Based on a rating scale of 1 to 5, Marathon (imidacloprid) provided the most effective control (Table 78). When examining population counts, only the precounts had statistical separation; however, Altus, Marathon and Ventigra at the higher rate provided excellent control through 5 months after application. Pradia, Sarisa and Talus demonstrated good efficacy through 3 months after treatment, while AzaGuard had some suppressive activity. In terms of plant growth, Pradia at 16.5 fl oz and Altus at 14 fl oz increased number of twigs while Ventigra at 7 fl oz and Altus at 14 fl oz increased hibiscus stem diameter compared to Nontreated water control. No phytotoxicity was observed on any of the treated plants. (Data not shown, refer to researcher report).

Table 72. Efficacy of Insecticides on Lobate Lac Scale on Hibiscus (*Hibiscus rosa-sinensis*) ‘Dainty White’, Cheng, HI, 2018.

Treatment	Rate Per 100 Gal	PreTreatment (12/16/19 - 2DBT)	First evaluation (2/8/20 – 52 DAT)	Second evaluation 3/23/20 – 98 DAT	Third evaluation 5/18/20 – 154 DAT)
Scale Infestation (1-5 scale: 1= none present, 5 = kill plants)					
Afidopyropen	4.8 fl oz	1.8 ± 0.5 a	2.8 ± 0.3 bc	2.3 ± 0.8 ab	2.9 ± 0.4 ab
Afidopyropen	7 fl oz	2.0 ± 0.4 a	3.0 ± 0.4 abc	3.0 ± 0.4 ab	2.5 ± 0.5 ab
Azadirachtin	16 fl oz	2.0 ± 0.4 a	3.3 ± 0.3 abc	2.3 ± 0.5 ab	3.0 ± 0.4 ab
Azadirachtin	32 fl oz	2.0 ± 0.4 a	3.5 ± 0.4 ab	3.0 ± 0.4 ab	3.6 ± 0.4 a
Buprofezin	14 oz	2.0 ± 0.4 a	3.4 ± 0.5 abc	2.5 ± 0.6 ab	2.4 ± 0.4 b
Cyclaniliprole	22 fl oz	2.0 ± 0.4 a	2.9 ± 0.4 abc	2.5 ± 0.3 ab	2.9 ± 0.5 ab
Cyclaniliprole	28 fl oz	2.0 ± 0.4 a	3.1 ± 0.3 abc	3.3 ± 0.5 a	3.0 ± 0.4 ab
Cyclaniliprole + Flonicamid	12 fl oz	2.0 ± 0.4 a	2.9 ± 0.4 abc	2.8 ± 0.6 ab	3.3 ± 0.3 ab
Cyclaniliprole + Flonicamid	16.5 fl oz	2.0 ± 0.4 a	3.5 ± 0.5 ab	2.3 ± 0.5 ab	3.3 ± 0.5 ab
Flupyradifurone	14 fl oz	2.0 ± 0.4 a	2.8 ± 0.8 bc	2.3 ± 0.5 ab	3.0 ± 0.4 ab
Imidacloprid	1.5 fl oz	2.0 ± 0.4 a	2.4 ± 0.2 c	1.8 ± 0.3 b	2.1 ± 0.1 b
Water	-	2.0 ± 0.4 a	3.9 ± 0.3 a	2.3 ± 0.6 ab	3.1 ± 0.5 ab
Number of lobate lac scale adults (Henderson’s Percent Control)					
Afidopyropen	4.8 fl oz	8.8 ab	2.0 a (98)	2.5 a (94)	33.3 a (44)
Afidopyropen	7 fl oz	8.8 ab	3.3 a (96)	3.8 a (92)	6.8 a (89)
Azadirachtin	16 fl oz	10.0 ab	26.0 a (73)	15.3 a (71)	21.8 a (68)
Azadirachtin	32 fl oz	10.8 ab	24.3 a (77)	29.0 a (48)	30.0 a (59)
Buprofezin	14 oz	18.0 ab	5.0 a (97)	25.3 a (73)	11.5 a (91)
Cyclaniliprole	22 fl oz	14.0 ab	14.0 a (90)	21.5 a (70)	22.0 a (77)
Cyclaniliprole	28 fl oz	15.8 ab	26.5 a (83)	6.8 a (92)	22.8 a (79)
Cyclaniliprole + Flonicamid	12 fl oz	11.8 ab	8.0 a (93)	13.3 a (78)	19.5 a (75)
Cyclaniliprole + Flonicamid	16.5 fl oz	12.5 ab	17.8 a (85)	34.5 a (47)	56.5 a (33)
Flupyradifurone	14 fl oz	20.0 b	5.0 a (97)	8.8 a (92)	15.8 a (88)
Imidacloprid	1.5 fl oz	7.8 ab	2.5 a (97)	1.3 a (97)	2.8 a (95)
Water	-	5.8 a	56.0 a (0)	29.8 a (0)	38.8 a (0)

Comparative Efficacy on Palm Scales

Palm scales (insect family halimococcidae) are typically found on the leaves of palm trees where they suck sap, but some species occur on *Pandanus*. Most palm scale species are dark brown or black and pyramid shapes; they usually do not secrete wax but some species have lateral strands. IR-4 has conducted a single efficacy experiment so far on hala scale.

Hala Scale.

In 2019, Cheng studied the impact of 9 products for management of Hala Scale (*Thysanococcus pandani*) on Hala trees (*Pandanus tectorius*). Each product was applied one or up to three times at 2-week intervals, with the last treatment occurring 28 days after the first application (DPT). Efficacy was assessed by the percentage of scale easily removed from leaves by placing a clear tape on the leaves, peeling it off, and then counting scales on the leaf and on the tape. The best treatments were Altus and Talus which both provided 94% or higher removal of scale (Table 73).

Table 73. Efficacy for Hala Scale on Hala, Cheng, HI, 2019.

Treatment	Rate per 100 gal	Percent scale removed easily from infested leaf with clear tape					
		0 DPT	7 DPT	14 DPT	28DPT	56 DPT	112 DPT
Altus (Flupyradifurone)	14fl oz	69±7a	69±7a	69±7a	69±7a	81±10a	94±3ab
AzaGuard (Azadirachtin)	16 fl oz	74±12a	74±12a	74±12a	74±12a	47±9c	46±10cd
KOC22018-8 (Botanical Oil Blend)	128 fl oz	78±6a	78±6a	78±6a	78±6a	71±9abc	51±11cd
Merit 2F (Imidacloprid)	1.5 fl oz	67±10a	67±10a	67±10a	67±10a	43±8c	46±11cd
Pradia (Cyclaniliprole +flonicamid)	16.5 fl oz	43±12a	43±12a	43±12a	43±12a	52±12bc	35±9d
Talus 70DF (Buprofezin)	14 fl oz	58±11a	58±11a	58±11a	58±11a	82±7a	99±1a
TetraCURB Concentrate (Rosemary Oil)	128 fl oz	54±9a	54±9a	54±9a	54±9a	66±7abc	63±14bcd
TetraCURB Organic (Rosemary Oil)	128 fl oz	49±12a	49±12a	49±12a	49±12a	47±12c	37±13d
Sarisa (Cyclaniliprole)	28 fl oz	69±13a	69±13a	69±13a	69±13a	61±9abc	72±13abc
Ventigra (Afidopyropen)	7 fl oz	40±7a	40±7a	40±7a	40±7a	71±4abc	77±14abc
	4.8fl oz	58±10a	58±10a	58±10a	58±10a	78±5ab	50±13cd
Nontreated Control	-	46±11a	46±11a	46±11a	46±11a	52±9bc	35±13d

Comparative Efficacy on Pit Scales

Pit scales (insect family Asterolecaniidae) have their name because they cause round depressions, or pits, where the settle and feed. Adults can be various colors including brown, green and tan. To date, IR-4 has sponsored one efficacy experiment for members of this scale family.

Holly Pit Scale

Holly pit scale (*Asterolecanium puteanum*) attacks certain hollies including American holly,

Burford holly, and Japanese holly. It causes pitting and distortion of woody tissue on branches and trunk of the tree. Severe infestations may result in branch dieback.

In 2009, Buss conducted a test on the efficacy of neonicotinoids (Aloft, Flagship, Safari and TriStar), insect growth regulators (Distance and Talus) and Rycar (pyrifluquinazon) for control of holly pit scale on holly (*Ilex x attenuata*). No statistically significant differences were observed until 6 weeks after treatment (Table 74). At this date, only Aloft provided good control.

No significant phytotoxicity was observed.

Table 74. Efficacy on Holly Pit Scale on Holly, ‘East Palatka’, Buss, FL, 2009.

Treatment	Rate Per 100 Gal	Application Method	Number of Holly Pit Scale Nymphs (Henderson’s % Control)				
			Pretreat	1 WAT	2 WAT	4 WAT	6 WAT
Aloft SC	10 fl oz	Foliar	44.7 a	131.5 a (0)	90.8 a (0)	123.2 a (0)	26.5 a (80)
Distance IGR	12 fl oz	Foliar	31.0 a	281.3 a (0)	217.5 a (0)	386.7 a (0)	181.8 c (57)
Flagship 25WG	4 gm/in DBH	Drench	55.5 a	343.7 a (0)	243.0 a (0)	177.5 a (0)	74.7 abc (62)
Rycar 20SC	18 fl oz	Foliar	64.0 a	137.5 a (17)	153.0 a (0)	155.5 a (0)	58.7 abc (66)
Orthene TTO	8 oz	Foliar	26.2 a	262.7 a (0)	157.8 a (11)	80.2 a (29)	45.8 ab (48)
Safari 20SG	6 g/ft ht	Sprenc	38.0 a	170.5 a (0)	153.2 a (0)	108.8 a (0)	43.2 ab (64)
Safari 2G	60 g/ft ht	Soil surface	155.8 a	350.5 a (13)	117.5 a (50)	222.2 a (0)	91.2 abc (63)
Talus 40 SC	21.5 fl oz	Foliar	17.8 a	313.5 a (0)	191.5 a (9)	255.0 a (0)	76.2 abc (73)
TriStar 30 SG	8 oz	Foliar	102.2 a	204.5 a (23)	77.7 a (43)	190.0 a (0)	80.0 abc (62)
Nontreated	-	-	122.5 a	316.5 a (0)	212.7 a (0)	151.2 a (0)	166.2 bc (0)

* Means within columns with the same letter are not significantly different ($P < 0.05$, LSD test).

Comparative Efficacy on Soft Scales

Soft scales (insect family Coccidae) are named because adult females, after they settle down to feed, produce a soft, waxy covering. This outer scale covering can be various different colors including white, brown, yellow, gray or multicolored.

IR-4 has conducted 13 experiments on soft scale species. Across species, the most efficacious products were Tristar, Arena/Celero, and Flagship. Efficacy was variable depending on species for Distance, Safari, Talus, and Marathon.

Table 75. Comparative Efficacy for Soft Scale

Product (Active Ingredients)	MOA	Indian Wax Scale (Ceroplastes ceriferus)	Florida Wax Scale (Ceroplastes floridensis)	Scale, Calico (Eulecanium cerasorum)	Scale, Magnolia (Neolecanium cornuparvum)	Cottony Maple Scale (Neopulvinaria innumerabilis)	Fletcher Scale (Parthenolecanium fletcheri)
A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28				4.0 (4 - 4) n1 Labeled		
Acelepryn (Dupont) (Chlorantraniliprole)	IRAC 28			1.0 (1 - 1) n1			
Arena 50WDG (Clothianadin)	IRAC 4A		5.0 (5 - 5) n1	3.0 (3 - 3) n1			
Celero 16WSG (Clothianadin)	IRAC 4A		3.7 (3 - 5) n3 Labeled				
Cygon 2E (Dimethoate)	IRAC 1B	1.0 (1 - 1) n1 Labeled					
Discus (Imidacloprid + cyfluthrin)	IRAC 4A + IRAC 3A						3.0 (3 - 3) n2 Labeled
Distance (Pyriproxyfen)	IRAC 7C		4.0 (4 - 4) n1 Labeled	1.0 (1 - 1) n1 Labeled	5.0 (5 - 5) n1 Labeled		1.0 (1 - 1) n1 Labeled
DPX-HGW86 (Cyantraniliprole)	IRAC 28			1.0 (1 - 1) n1 Labeled			
Dursban Pro (Chlorpyrifos)	IRAC 1B						5.0 (5 - 5) n1
Flagship 0.22G (Thiamethoxam)	IRAC 4A				5.0 (5 - 5) n1		
Flagship 25WG (Thiamethoxam)	IRAC 4A		3.8 (3 - 5) n5 Labeled			3.0 (3 - 3) n1 Labeled	3.5 (3 - 4) n2 Labeled
GF-2626 1SC (Sulfoxaflor)	IRAC 4C				5.0 (5 - 5) n1		
Kontos 240SC (Spirotetramat)	IRAC 23			2.0 (2 - 2) n1 Labeled			
Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28			5.0 (5 - 5) n1			
Marathon II (Imidacloprid)	IRAC 4A		5.0 (5 - 5) n1 Labeled			1.0 (1 - 1) n1 Labeled	

Merit 75WP (Imidacloprid)	IRAC 4A			1.0 (1 - 1) n2 Labeled			
Orthene TTO 97 (Valent) (Acephate)	IRAC 1B		1.0 (1 - 1) n2 Labeled				
RTSA 721 (RTSA 721)	unknown				3.0 (3 - 3) n2		
Safari 20SG (Dinotefuran)	IRAC 4A		4.5 (4 - 5) n2 Labeled	3.0 (1 - 5) n5 Labeled		1.0 (1 - 1) n2 Labeled	2.0 (2 - 2) n2 Labeled
Safari 2G (Dinotefuran)	IRAC 4A			1.0 (1 - 1) n1 Labeled			
Talstar Flowable Insecticide/Miticide (Bifenthrin)	IRAC 3A			1.0 (1 - 1) n1		1.0 (1 - 1) n1	
Talus 40SC (Buprofezin)	IRAC 16		3.0 (2 - 4) n2 Labeled			1.0 (1 - 1) n1 Labeled	2.0 (1 - 3) n2 Labeled
Talus 70DF (Buprofezin)	IRAC 16				3.0 (3 - 3) n1 Labeled		
Talus WP (Buprofezin)	IRAC 16						3.0 (3 - 3) n1 Labeled
TriStar 30SG (Acetamiprid)	IRAC 4A		5.0 (5 - 5) n1 Labeled			1.0 (1 - 1) n1 Labeled	
TriStar 70WSP (Acetamiprid)	IRAC 4A		5.0 (5 - 5) n3 Labeled				3.0 (3 - 3) n1 Labeled
Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C			3.0 (3 - 3) n1 Labeled	5.0 (5 - 5) n1 Labeled		

Calico Scale.

In 2007, Potter conducted an experiment examining efficacy of Safari 20SG (dinotefuran) on calico scale (*Eulecanium cerasorum*) infesting Japanese zelkova (*Zelkova serrata*). Safari 20SG was applied using two methods of systemic application: soil injection or basal trunk spray with Pentra-Bark, a bark-penetrating surfactant. Treatments were made to 4 trees either April 18 or May 15, 2007. Efficacy was evaluated from July 30 to August 2 by sampling eight twigs within each tree canopy, removing the two oldest leaves from each twig, and counting all living scale nymphs on the left half of the abaxial surface of each leaf. Safari 20SG, particularly the application with Pentra-Bark, provided significant control of calico scale nymphs on the leaves (Table 76), which should translate to fewer honeydew-producing adults the next spring.

Table 76. Efficacy on Calico Scale on Japanese Zelkova, Potter, KY, 2007.

Treatment	Rate	Application Method (Treatment Date)	Population Counts	Percent Control
Safari 20SG (dinotefuran)	8.85 g/inch trunk diam.	Soil Injection (18 April)	159 ± 33*	61.9
Safari 20SG (dinotefuran)	8.85 g/inch trunk diam.	Soil Injection (15 May)	119 ± 34*	71.5
Safari 20SG (dinotefuran) + Pentra-Bark	13 oz/1.1 gal	Trunk Spray (18 April)	65 ± 29*	84.4
Nontreated	-	-	332 ± 109	-

* Asterisk denotes mean is significantly lower than mean for Nontreated trees (Dunnett's test, $P < 0.05$).

In 2011, Sadoff conducted experiments examining efficacy of systemic and foliar insecticides targeted to egg-laying calico scale females infesting honeylocust (Tables 3 and 4). Systemic insecticides were applied to the soil or sprayed to trunk with Pentrabark. Systemics were applied April 10 (clothianidin and imidacloprid) and May 4 (dinotefuran). Foliar treatments were applied on May 4. Systemic insecticides provided significant, but generally mediocre, control of calico scales; high scale mortality on trees treated with Arena was attributed to the phytotoxic effects of this product on honeylocust. Similarly, the foliar insecticides generally provided mediocre efficacy.

No phytotoxicity was observed on any of the treated plants except with Arena which caused up to 50 % leaf drop.

Table 77. Efficacy of Systemic Insecticides on Calico Scale on Honeylocust (*Gleditzia triacanthos inermis*), Sadoff, IN, 2011.

Applic. Method	Treatment	Rate Per Inch DBH	% Dead Female Adults ^x		First Instar Mortality 29 DAT (6/14)		Second Instar Mortality 59 DAT	
			7 DAT (5/11)	14 DAT (5/18)	No. Live Scales	% Dead Scales	No. Live Scales	% Dead Scales
Trunk Applic.	Transtect 70WSP (dinotefuran)	1.7 g ai	16.00 ab	18.94 a	12.58 c	23.77 bcd	7.70 c	49.84 ab
	Transtect 70WSP + Pentrabark	1.7 g ai	27.33 a	42.98 a	6.36 ab	36.83 bc	2.47 ab	68.54 a
	Xytect 75WSP (imidacloprid)	1.7 g ai	10.83 b	23.89 a	13.93 bc	12.47 d	5.81 ab	42.52 b
	Xytect 75WSP + Pentrabark	1.7 g ai	12.50 ab	20.00 a	11.80 c	20.50 bcd	6.81 bc	41.33 b
Soil Applic.	Arena 50WDG (clothianidin)	3.6 g ai	9.00 b	46.00 a	1.82 a	80.90 a	0.75 a	58.68 ab
	Safari 2G	3.0 g ai	12.00 ab	23.45 a	5.60 a	39.83 b	2.95 abc	58.15 ab
	Transtect 70WSP	1.45 g ai	6.67 b	36.67 a	4.59 a	26.92 bcd	1.92 ab	61.84 ab
	Xytect 75WSP	1.38 g ai	16.25 ab	43.81 a	5.98 a	26.76 bcd	4.50 abc	56.94 ab
-	Nontreated	-	7.25 b	20.00 a	12.50 c	13.96 cd	4.71 abc	44.06 ab

^x Means within a column followed by the same letter are not significantly different based on LSD test (P=0.05).

In 2012, Sadoff conducted two experiments examining efficacy of Distance and other insecticides targeted to egg-laying calico scale females in Carmel, IN (Table 80) and to settled crawler stages in Indianapolis (Table 80) on honeylocust. In Carmel, treatments were applied on Mar 20, except Transtect which was applied Mar 25. At 44 DAT, Distance and Safari significantly reduced scale numbers; at 74 DAT, Safari and Transtect, Talstar, and Mainspring had significantly reduced scales. In Indianapolis, treatments were applied on June 6, targeted to crawler stages, showed significant effects of treatment at 14 DAT. Talstar had the lowest number of scales, followed by Distance. Transtect failed to reduce scale abundance likely due to the short period of time between application and evaluation.

Overall, these studies suggest that dinotefuran (Safari or Transtect) works to suppress calico scale if applied to target ovipositing females. Mainspring may also provide some level of scale suppression if applied at this time. Talstar would require repeated applications targeting ovipositing females and settled crawlers.

Table 78. Efficacy of Foliar Insecticides on Calico Scale on Honeylocust (*Gleditzia triacanthos inermis*), Sadoff, IN, 2011.

Treatment	Rate Per 100 Gal	% Dead Female Adults ^x		First Instar Mortality 29 DAT (6/14)		Second Instar Mortality 59 DAT (7/13)	
		7 DAT (5/11)	14 DAT (5/18)	No. Live Scales	% Dead Scales	No. Live Scales	% Dead Scales
Acelepryn (chlorantraniprilole)	4 fl oz	8.33 c	23.93 bc	6.18 abc	42.14 a	1.71 a	85.12 a
Acelepryn + Capsil	4 + 8 fl oz	7.14 c	22.62 bc	8.96 bc	25.44 b	1.49 a	67.78 ab
Capsil	8 fl oz	4.59 c	10.71 c	10.58 cd	21.77 b	4.04 a	37.33 c
HWG 355 (cyantraniprilole) + Capsil	4 + 8 oz	10.06 c	44.48 b	3.82 a	50.12 a	1.56 a	62.13 b
Talstar One (bifenthrin)	20 fl oz	19.29 b	70.00 a	6.47 abc	16.98 b	2.66 a	25.78 c
Talstar One + Capsil	20 + 8 fl oz	35.00 a	77.14 a	4.14 ab	15.73 b	2.04 a	23.97 c
Nontreated	-	5.71 c	9.37 c	14.85 d	11.70 b	3.72 a	38.62 c

^x Means within a column followed by the same letter are not significantly different based on LSD test (P=0.05).

Table 79. Efficacy of Foliar Insecticides on Calico Scale on Honeylocust (*Gleditzia triacanthos inermis*), 'Skyline' Sadoff, Carmel, IN, 2012.

Treatment	Rate Per 100 Gal	Number of Dead Ovipositing Females ^x		Live Females at 74 DAT (5/31)	
		29 DAT (4/18)	44 DAT (5/3)	Number	% Reduction
Distance (pyriproxyfen)	12 fl oz	14.03 a	45.62 a	34.64 ab	23.05
Mainspring (cyantraniprilole)	4 fl oz	19.25 a	41.94 ab	24.91 a	44.66
Safari 20SG (dinotefuran) soil	1.52 gm ai/in DBH	10.47 a	43.64 a	20.34 a	54.81
Talstar One (bifenthrin)	20 fl oz	18.61 a	34.08 ab	29.68 a	34.07
Transtect 70WSP (dinotefuran) soil	1.46 gm ai/in DBH	7.20 a	40.14 ab	27.06 a	39.89
Nontreated	-	8.32 a	32.93 b	45.02 b	0

^x Means within a column followed by the same letter are not significantly different based on LSD test (P=0.05).

Table 80. Efficacy of Foliar Insecticides on Calico Scale on Honeylocust (*Gleditzia triacanthos inermis*), 'Skyline' Sadoff, Indianapolis, IN, 2012.

Treatment	Rate Per 100 Gal	Pretrt (6/6)	14 DAT (6/20)		
		No. Live Females	No. Live Females	% Change	% Reduction
Distance (pyriproxyfen)	12 fl oz	28.01 ab	17.48a	-60.28	28.67b
Talstar One (bifenthrin)	20 fl oz	23.03 a	12.12a	-90.10	69.32a
Transtect 70WSP (dinotefuran) soil	1.46 gm ai/ in DBH	ND	ND	-31.21*	12.01b
Nontreated	-	33.97 ab	23.99 ab	-41.58	11.23b

^x Means within a column followed by the same letter are not significantly different based on LSD test (P=0.05).

* Estimated from average of pre treatment densities.

In 2014, Persad conducted an experiment examining efficacy of systemic and foliar insecticides on calico scale (*Eulecanium cerasorum*) infesting honeylocust (*Gleditzia triacanthos inermis*). The systemic insecticide Safari provided the best control, with the other systemic Mainspring, and the foliar products Kontos and Xxpire generally less effective (Table 81).

Table 81. Efficacy of Insecticides on Calico Scale on Honeylocust (*Gleditzia triacanthos inermis*), Persad, OH, 2014.

Treatment*	Rate Per 100 Gal	Population Averages ^x (Henderson's Percent Control)				
		Pre	7 DAT	15 DAT	28 DAT	107 DAT
Kontos (spirotetramat)	3.4 oz	14.75 a	6.75 c (53)	2.50 cd (76)	2.50 b (77)	0 a
Mainspring (cyantraniliprole)	0.25 fl oz/inch DBH	13.25 a	13 ab (11)	4.25 bcd (54)	0.25 b (84)	0 a
Safari 20SG (dinotefuran)	6 g/inch DBH	14.25 a	12.25 ab (0)	0.75 d (92)	0.00 b (100)	0 a
Xxpire 40WG (spinoteram+sulfoxaflor)	2.0 oz	13.75 a	9.00 bc (32)	7.50 ab (18)	5.75 b (42)	0 a
	2.75 oz	17.5 a	6.00 c (65)	5.75 bc (53)	3.75 b (70)	0 a
	3.5 oz	23.00 a	5.75 c (74)	5.25 bcd (67)	2.00 b (88)	0 a
Nontreated Check	-	16.25 a	15.75 a (0)	11.25 a (0)	11.75 a (0)	0 a

^x Numbers of live nymphs were counted on 3 branchlets 15 cm in length randomly selected and cut from each tree. Means within column followed by the same letter are not significantly different (LSD, P=0.05).

* Mainspring and Safari applied as drench.

Cottony Maple Scale.

In 2005, Davis and Smitley examined various treatments to manage cottony maple scale (*Pulvinaria innumerabilis*) on silver maple (*Acer saccharinum*). Treatments were applied to 5 trees starting July 19, 2005. Safari 20SG was drenched once; the remaining treatments were foliar sprays applied on July 19 and August 2. Populations were assessed prior to the first applications and then on August 15 and August 22 by collecting 5 leaves per tree and counting the number of crawlers. The Nontreated populations declined rapidly after the 28 DAT confounding the results (Table 82). However, at 28 DAT there appeared to be good control achieved with foliar applications of Flagship 25WP (2 and 4 oz per 100 gallons) and Safari 20SG (4 oz per 100 gallons), although populations were not statistically different from the Nontreated control. More research is needed to clarify response of cottony maple scale with these treatments.

Table 82. Efficacy on Cottony Maple Scale on Silver Maple, Smitley & Davis, MI, 2005.

Treatment	Rate Per 100 Gal (No. Applications)	Pretreatment Counts	Counts (Henderson's Percent Control)		
			28 DAT	35 DAT	Combined 28 + 35 DAT
Flagship 25WP	2.0 oz (2)	45.0 a	0.2 a (96)	0.8 a (0)	1.0 a (82)
Flagship 25WP	4.0 oz (2)	37.0 a	0.8 a (81)	1.0 a (0)	1.8 a (61)
Safari 20SG	4.0 oz (2)	43.2 a	1.2 a (76)	1.6 a (0)	2.8 a (48)
Safari 20SG	8.0 oz (2)	63.8 a	3.4 a (54)	2.6 a (0)	6.0 a (25)
Safari 20SG – Drench	3 g (2)	39.2 a	6.6 a (0)	0.6 a (0)	7.2 a (0)
Safari 20SG – Drench	6 g (2)	37.2 a	1.4 a (67)	1.8 a (0)	3.2 a (31)
Talus 40SC	21.5 fl oz (2)	51.4 a	2.6 a (56)	0.8 a (0)	3.4 a (47)
TriStar 30SG	112 g (2)	35.8 a	5.0 a (0)	0.0 a (100)	5.0 a (0)
TriStar 30SG	224 g (2)	40.4 a	1.8 a (61)	0.2 a (49)	2.0 a (60)
Marathon II	1.7 fl oz (2)	61.2 a	4.2 a (41)	2.6 a (0)	6.8 a (11)
Talstar 0.67 F	10 fl oz (2)	55.2 a	2.0 a (69)	6.4 a (0)	8.4 a (0)
Nontreated check	-	62.4 a	7.2 a (0)	0.6 a (0)	7.8 a (0)

* B-1956 surfactant mixed with Safari and TriStar foliar applications.

Fletcher Scale.

In 2004, Smitley and Davis conducted an experiment examining efficacy on Fletcher scale (*Lecanium fletcheri*) on yew (*Taxus sp.*). These researchers added a number of treatments above and beyond the 2004 IR-4 protocol for scale efficacy, testing a total of 23 treatments as either foliar applications or banded applications around the base. The best efficacy was achieved with foliar applications of Discus + OSS and TriStar at 128 grams per 100 gal (Table 83). However, Dursban Pro, Flagship either banded or foliar sprays, Safari banded, Talus, and Tristar provided statistically equivalent control levels.

Table 83. Efficacy on Fletcher Scale on Yew, Smitley & Davis, MI, 2004.

Treatment	Rate	Application Type	Application Date(s)	Population Counts	Percent Control
Discus	1.91 gal/A	banded	6/18	3.00 ± 2.83 abcde	67
Discus + OSS	25 fl oz/100	foliar	6/29 & 7/14	1.17 ± 1.33 a	87
Distance 0.86E+ OSS	8fl oz/100 gal	foliar	6/29 & 7/20	8.17 ± 12.00 def	9
Distance 0.86E+ OSS	16 fl oz/100 gal	foliar	6/29 & 7/14	3.33 ± 2.07 bcde	63
Distance 0.86E+ OSS	32fl oz/100 gal	foliar	6/29 & 7/20	4.50 ± 2.59 def	50
Dursban Pro + OSS	1 qt/100 gal	foliar	6/29 & 7/14	2.83 ± 2.32 abcde	69
Flagship 25 WP	0.125 lb ai/A	banded	6/15	1.67 ± 1.97 abc	81
Flagship 25WP+ OSS	2 oz/100 gal	foliar	6/29 & 7/14	2.00 ± 1.55 abcd	78
Flagship 25WP+ OSS	4 oz/100 gal	foliar	6/29 & 7/14	3.33 ± 1.97 bcde	63
Flagship 25WP+ OSS	8 oz/100 gal	foliar	6/29 & 7/14	2.50 ± 0.84 abcde	72
Safari 20SG + OSS	8 oz/100 gal	foliar	6/29 & 7/14	3.50 ± 2.17 cde	61
Safari 20SG	12 oz/100 gal	banded	6/15	4.67 ± 1.75 ef	48
Safari 20SG	24 oz/100 gal	banded	6/15	2.00 ± 1.10 abcde	78
Safari 20SG	48 oz/100 gal	banded	6/15	3.17 ± 2.93 abcde	72
Talus 40SC+ OSS	21.5 fl oz/100 gal	foliar	6/29	2.00 ± 1.79 abcd	78
Talus 40SC+ OSS	43.0 fl oz/100 gal	foliar	6/29	2.33 ± 1.21 abcde	74
Talus 40SC+ OSS	86.0 fl oz/100 gal	foliar	6/29	3.17 ± 2.93 abcde	65
Talus 70WP+ OSS	14 oz/100 gal	foliar	6/29	2.17 ± 1.47 abcde	76
Talus 70WP+ OSS	28 oz/100 gal	foliar	6/29	3.83 ± 2.64 de	57
Talus 70WP+ OSS	14 oz/100 gal **	foliar	6/29	4.83 ± 4.45 def	46
TriStar	32 grams/100 gal	foliar	6/29 & 7/14	3.50 ± 2.43 abcde	61
TriStar	64 grams/100 gal	foliar	6/29 & 7/14	2.00 ± 1.10 abcde	78
TriStar	128 grams/100 gal	foliar	6/29 & 7/14	1.17 ± 1.17 ab	87
Nontreated Control	-	-	-	9.00 ± 3.63 f	0

* All data were transformed log (1+x) before statistical analysis. Means followed by the same letter are not significantly different (p<0.05). Untransformed means are presented in the table. See experiment report in Appendix 3 for additional information on statistical separation.

** This treatment was supposed to have been 56 oz/100 gal

Florida Wax Scale.

From 2004 through 2009, 5 experiments were conducted to examine insecticide efficacy for Florida wax scale (*Ceroplastes floridensis*). In general, the neonicotinoids Flagship, Safari and TriStar provided excellent control, and the IGR Talus provided good control.

During 2004 and 2005, Ludwig conducted four Florida wax scale (*Ceroplastes floridensis*) efficacy experiments on dwarf Burford holly (*Ilex cornuta* 'Burfordii Nana'), holly 'China Doll' (*Ilex sp.*), and Indian hawthorn (*Rhaphiolepis indica*).

Ludwig 2004. Dwarf Burford hollies with natural infestations of Florida wax scale were treated with foliar or drench applications depending on the product. Three rates of each product were applied to 4 plant replicates. Foliar applications were applied at 0 DAT and 16 DAT. Safari 20SG drenches were applied just at 0 DAT. Visual assessments of live scales on twenty leaves per plant were made using the same leaves throughout the experiment. At 45 DAT these same leaves were harvested, taken to the lab, scales were flipped over and live ones were counted. The

best treatments were Flagship (2, 4, and 8 oz), Safari (24 and 48 oz), and TriStar 70WSP (32, 64, and 128 g), however all treatments did reduce the number of live scale (Table 84).

Table 84. Efficacy on Florida Wax Scale (*Ceroplastes floridensis*) on Dwarf Burford Holly, Ludwig, TX, 2004.

Treatment (Rate)	Population Averages (Henderson's Percent Control)				
	0 DAT (Visual)	16 DAT (Visual)	30 DAT (Visual)	43 DAT (Visual)	45 DAT (Microscope)
Distance (8 fl oz/100 gal)	124.8	164.3 (11)	142.5 (14)	118.5 (15)	23.8 bc (73)
Distance (16 fl oz/100 gal)	113.8	173.0 (0)	149.8 (1)	101.5 (20)	19.8 bc (76)
Distance (32 fl oz/100 gal)	143.0	173.0 (18)	199.8 (0)	174.3 (0)	14.0 bc (86)
Flagship (2 oz/100 gal)	128.5	162.5 (14)	89.3 (48)	65.5 (54)	0.3 d (100)
Flagship (4 oz/100 gal)	129.3	146.0 (23)	93.8 (46)	70.5 (51)	0.0 d (100)
Flagship (8 oz/100 gal)	128.3	181.8 (4)	73.3 (57)	47.5 (67)	0.0 d (100)
Safari (12 oz/100 gal) - Drench	117.0	181.3 (0)	164.8 (0)	119.0 (9)	6.0 cd (93)
Safari (24 oz/100 gal) - Drench	129.5	137.8 (28)	125.8 (27)	96.3 (33)	1.0 d (99)
Safari (48 oz/100 gal) - Drench	104.5	131.3 (15)	110.3 (21)	38.5 (67)	0.0 d (100)
Talus 40SC (21.5 fl oz/100 gal)	105.0	152.5 (2)	121.5 (13)	94.0 (20)	13.8 bc (82)
Talus 40SC (43 fl oz/100 gal)	110.8	143.0 (12)	114.3 (23)	96.5 (22)	13.0 bc (84)
Talus 40SC (86 fl oz/100 gal)	185.8	203.5 (26)	200.0 (19)	160.3 (23)	17.5 bc (87)
TriStar 70WSP (32 g/100 gal)	125.5	112.5 (39)	54.8 (67)	40.5 (71)	0.0 d (100)
TriStar 70WSP (64 g/100 gal)	142.8	179.3 (15)	88.5 (54)	79.8 (50)	0.0 d (100)
TriStar 70WSP (128 g/100 gal)	107.3	125.0 (21)	59.3 (59)	42.5 (64)	0.0 d (100)
Nontreated	132.5	195.5 (0)	177.0 (0)	147.5 (0)	94.8 a (0)

* Letters after numbers are based on separation of average number of scale on the same 20 leaves throughout the experiment.

Ludwig 2005a. In 2005, Dwarf Burford hollies with natural infestations of Florida wax scale were treated with foliar applications of 4 products (Celero 16WSG, Flagship 25WG, Orthene TTO97, and TriStar 30SG) with repeat applications 14 days after initial application. This experiment was conducted in a commercial nursery with 5 plants per treatment. Visual assessments of live scales on twenty leaves per plant were made using the same leaves throughout the experiment. At 56 DAT these same leaves were harvested, taken to the lab, scales were flipped over and live ones were counted. By 56 DAT, the three neonicotinoids (Flagship 25WG, TriStar 30SG, Celero 16WSG) provided excellent control of adult scales. Orthene TTO exhibited 60% control, statistically equivalent to the Nontreated.

Table 85. Efficacy on Florida Wax Scale (*Ceroplastes floridensis*) on Dwarf Burford Holly, Ludwig, TX, 2005a.

Scale Stage	Treatment	Rate Per 100 Gal	Population Averages (Henderson's Percent Control)				
			Pre-treatment counts	14 DAT (visual)	28 DAT (visual)	42 DAT (visual)	56 DAT (microscope)
Nymph	Flagship 25WG	2 oz	0.0	13.4 ab	8.2 ab	3.8 ab	0.0
	Flagship 25WG	4 oz	0.0	21.6 a	12.6 a	10.2 a	0.0
	TriStar 30SG	4 oz	0.0	10.4 ab	7.2 ab	6.0 b	0.0
	TriStar 30SG	8 oz	0.0	10.6 b	6.6 ab	4.6 ab	0.0
	Celero 16WSG	4 oz	0.0	11.8 ab	7.8 ab	7.2 ab	0.0
	Orthene TTO 97	8 oz	0.0	15.2 ab	7.0 ab	4.2 ab	0.0
	Nontreated			0.0	8.6 ab	4.2 b	3.6 b
Adults	Flagship 25WG	2 oz	21.0 ab	57.8 ab (49)	92.2 a (8)	75.0 a (36)	2.4 b (98)
	Flagship 25WG	4 oz	24.6 a	51.6 ab (61)	74.4 ab (37)	72.2 a (47)	2.6 bc (98)
	TriStar 30SG	4 oz	21.0 ab	47.0 ab (58)	41.0 bc (59)	39.0 ab (67)	0.2 d (100)
	TriStar 30SG	8 oz	20.0 ab	33.4 b (69)	34.8 c (64)	30.0 b (73)	0.4 cd (100)
	Celero 16WSG	4 oz	19.2 ab	39.4 ab (62)	49.8 abc (46)	50.2 ab (53)	1.2 bcd (99)
	Orthene TTO 97	8 oz	18.2 ab	61.2 a (38)	84.8 ab (3)	78.6 a (23)	34.0 a (60)
	Nontreated			13.8 b	74.4 a (0)	66.0 ab (0)	77.0 a (0)
Total	Flagship 25WG	2 oz	21.0	71.2 (44)	100.4 (6)	78.8 (36)	2.4 (98)
	Flagship 25WG	4 oz	24.6	73.2 (51)	87.0 (30)	82.4 (43)	2.6 (98)
	TriStar 30SG	4 oz	21.0	57.6 (54)	47.6 (55)	43.6 (64)	0.2 (100)
	TriStar 30SG	8 oz	20.0	43.8 (64)	42.0 (59)	36.0 (69)	0.4 (100)
	Celero 16WSG	4 oz	19.2	51.2 (56)	57.6 (41)	57.4 (49)	1.2 (99)
	Orthene TTO 97	8 oz	18.2	76.4 (30)	91.8 (1)	82.8 (22)	34.0 (60)
	Nontreated			13.8	83.0 (0)	70.2 (0)	80.6 (0)

* Letters after numbers are based on separation of average number of scale on 5 plants.

Ludwig 2005b. In 2005, 'China Doll' hollies with natural infestations of Florida wax scale were treated with foliar applications of 4 products (Celero 16WSG, Flagship 25WG, Orthene TTO97, and TriStar 30SG) with repeat applications 14 days after initial application. This experiment was conducted in a commercial nursery with 4 plants per treatment. Visual assessments of live scales on twenty leaves per plant were made using the same leaves throughout the experiment. At 45 DAT these same leaves were harvested, taken to the lab, scales were flipped over and live ones were counted. By 45 DAT, the best treatments were the 4 oz rate of Flagship 25WP, both rates of TriStar 30SG, and Orthene TTO (Table 86).

Held 2009. In 2009, Held investigated efficacy of the systemic neonicotinoid insecticides Arena, Meridian, Merit and Safari applied as drench at different timings targeted to first or second generation of Florida wax scale on holly 'Needlepoint'. Each product was applied once at pre-crawler hatch (4/13/10) or crawler hatch (5/26/10) for the first generation, or at pre-crawler hatch (8/31/10) for the second generation. All products targeting the first generation (applied at pre-crawler hatch or crawler hatch) provided excellent control, performing better than those applied in August against the second generation (Table 87).

Ludwig 2005c. During 2005, Ludwig tested Florida wax scale efficacy on a third crop, Indian hawthorn. In this test, only neonicotinoids were applied (Table 88). All three products – Celero, Flagship and TriStar – provided great to excellent control.

Table 86. Efficacy on Florida Wax Scale (*Ceroplastes floridensis*) on Holly ‘China Doll’, Ludwig, TX, 2005b.

Scale Stage	Treatment	Rate Per 100 Gal	Population Averages (Henderson’s Percent Control)			
			Pretreatment counts (Visual)	14 DAT (Visual)	28 DAT (Visual)	45 DAT (Microscope)
Nymph	Flagship 25WG	2 oz	247.3 a	13.3 ab (59)	12.3 ab (77)	0.0
	Flagship 25WG	4 oz	121.8 bc	1.5 bcd (91)	6.0 abc (77)	0.0
	TriStar 30SG	4 oz	149.8 bc	1.5 abc (92)	0.5 bcd (98)	0.0
	TriStar 30SG	8 oz	120.0 bc	6.5 cd (59)	2.8 d (89)	0.0
	Celero 16WWSG	4 oz	87.3 c	3.0 abcd (74)	4.0 abcd (79)	0.0
	Orthene TTO 97	8 oz	200.5 ab	0.0 d (100)	2.3 cd (95)	0.0
	Talus 40SC	21.5 fl oz	133.0 abc	9.5 ab (46)	13.0 a (55)	0.0
	Nontreated		77.5 c	10.3 a (0)	16.8 a (0)	0.0
Adults	Flagship 25WG	2 oz	0.3	184.0 a	80.8 a	37.3 a
	Flagship 25WG	4 oz	0.0	86.8 bc	48.5 abc	5.0 bc
	TriStar 30SG	4 oz	0.0	65.5 abc	21.3 abc	5.8 ab
	TriStar 30SG	8 oz	0.3	77.8 c	44.5 d	13.8 c
	Celero 16WWSG	4 oz	0.0	42.0 c	21.8 cd	11.8 ab
	Orthene TTO 97	8 oz	0.0	124.0 ab	57.5 ab	4.8 bc
	Talus 40SC	21.5 fl oz	0.8	87.5 bc	49.8 bc	29.3 a
	Nontreated		0.0	54.3 bc	30.5 bc	28.3 a
Total	Flagship 25WG	2 oz	247.5	197.3 (4)	93.0 (38)	37.3 (59)
	Flagship 25WG	4 oz	121.8	88.3 (13)	54.5 (27)	5.0 (89)
	TriStar 30SG	4 oz	120.0	72.0 (28)	24.0 (67)	5.8 (87)
	TriStar 30SG	8 oz	150.0	79.3 (37)	45.0 (51)	13.8 (75)
	Celero 16WWSG	4 oz	87.3	45.0 (38)	25.8 (52)	11.8 (63)
	Orthene TTO 97	8 oz	200.5	124.0 (26)	59.8 (51)	4.8 (94)
	Talus 40SC	21.5 fl oz	133.8	97.0 (13)	62.8 (23)	29.3 (40)
	Nontreated		77.5	64.5 (0)	47.3 (0)	28.3 (0)

* Letters after numbers are based on separation of average number of scale on 20 leaves on each of 5 plants.

Table 87. Efficacy on Florida Wax Scale (*Ceroplastes floridensis*) on Holly ‘Needlepoint’, Held, AL, 2009.

Treatment	Rate	Application Timing	Total Population Counts ^z , Means Separations ^x , and Henderson’s Percent Control		
			Pretreatment	First Generation 6/24/10	Second Generation 10/25/10
Arena 50WDG	2.4 g/ft ht	April 13	28.25 ± 10.3	0.0 (100) b	0.0 (100) b
Meridian 25WG	3 g/ft ht	April 13	42.75 ± 23.9	1.0 ± 0.4 (96) b	0.0 (100) b
Merit 2F	0.2 fl oz/ft ht	April 13	30.75 ± 13.9	0.0 (100) b	0.0 (100) b
Safari 20SG	6 g/ft ht	April 13	30 ± 12.1	1.25 ± 1.25 (92) b	0.0 (100) b
Arena 50WDG	2.4 g/ft ht	May 26	21 ± 7.1	0.0 (100) b	0.0 (100) b
Meridian 25WG	3 g/ft ht	May 26	20.75 ± 8.1	0.25 ± 0.25 (98) b	0.0 (100) b
Merit 2F	0.2 fl oz/ft ht	May 26	21.75 ± 7.9	1.5 ± 0.87 (87) b	0.0 (100) b
Safari 20SG	6 g/ft ht	May 26	21.25 ± 7.2	0.25 ± 0.25 (98) b	0.5 ± 0.5 (99) b
Arena 50WDG	2.4 g/ft ht	August 31	40.75 ± 30	---	3.5 ± 1.7 (96) b
Meridian 25WG	3 g/ft ht	August 31	16.0 ± 8.8	---	9.25 ± 5.5 (73) ab
Merit 2F	0.2 fl oz/ft ht	August 31	15.25 ± 9	---	1.75 ± 1.75 (95) b
Safari 20SG	6 g/ft ht	August 31	15.5 ± 6.6	---	6.0 ± 2.9 (82) ab
Nontreated	-		44.25 ± 7.4	---	95.0 ± 78.6 (0) a

^x Means within a column followed by the same letter are not significantly different based on Tukey’s HSD test (P=0.05).

Table 88. Efficacy on Florida Wax Scale (*Ceroplastes floridensis*) on Indian Hawthorn, Ludwig, TX, 2005.

Scale Stage	Treatment	Rate Per 100 Gal	Population Averages (Henderson’s Percent Control)				
			Pretreatment counts (Visual)	15 DAT (Visual)	28 DAT (Visual)	41 DAT (Visual)	57 DAT (Microscope)
Nymph	Celero 16WSG	4 oz	0.0	42.0 a	50.4 a	12.2 bc	14.0 b
	Flagship 25WG	2 oz	0.0	32.2 a	45.4 a	24.2 b	13.6 ab
	Flagship 25WG	4 oz	0.0	42.8 a	55.6 a	30.2 b	9.2 ab
	TriStar 30SG	4 oz	0.0	35.5 a	6.5 a	4.0 c	7.5 b
	TriStar 30SG	8 oz	0.0	25.2 a	7.8 a	1.8 c	5.4 b
	Nontreated			0.0	42.0 a	64.2 a	140.2 a
Adults	Celero 16WSG	4 oz	41.4 a	--	--	--	27.8 b (90)
	Flagship 25WG	2 oz	51.0 a	--	--	--	22.0 b (94)
	Flagship 25WG	4 oz	48.6 a	--	--	--	13.8 b (96)
	TriStar 30SG	4 oz	46.8 a	--	--	--	6.5 b (98)
	TriStar 30SG	8 oz	32.6 a	--	--	--	6.2 b (97)
	Nontreated			37.2 a	--	--	--
Total	Celero 16WSG	4 oz	41.4	42.0 (10)	50.4 (29)	12.2 (92)	41.8 (87)
	Flagship 25WG	2 oz	51.0	32.2 (44)	45.4 (48)	24.2 (87)	35.6 (91)
	Flagship 25WG	4 oz	48.6	42.8 (22)	55.6 (34)	30.2 (84)	23.0 (94)
	TriStar 30SG	4 oz	46.8	35.5 (33)	6.5 (92)	4.0 (98)	14.0 (96)
	TriStar 30SG	8 oz	32.6	25.2 (32)	7.8 (86)	1.8 (99)	11.6 (95)
	Nontreated			37.2	42.0 (0)	64.2 (0)	140.2 (0)

* Letters after numbers are based on separation of average number of scale on 20 leaves on each of 5 plants. See experiment report in Appendix 3 for statistical separation details and scale averages for each treatment.

Magnolia Scale.

In 2020, Chong compared two application methods of RTSA 721 with Transect 70 WSP for management of magnolia scale (*Neolecanium cornuparvum*) infesting *Magnolia grandiflora* 'Bracken's Brown Beauty'. By 56 days after first application, Transect 70WSP reduced scale populations by 84% (Table 89). At 112 days after first application, RTSA 721 as either a drench or basal trunk spray also reduced scale populations.

Table 89. Efficacy on Magnolia Scale on *Magnolia grandiflora* ‘Bracken’s Brown Beauty’, Chong, SC, 2020.

Product	Appl. Rate	Appl. method	Mean densities at days after treatment (Henderson’s Percent Control)						
			-2 7/13/2020	7 7/22/2020	14 7/29/2020	28 8/12/2020	56 9/9/2020	112 11/4/2020	168 12/30/2020
RTSA 721	10 ml per inch DBH	Drench	11.5	14.8 (21)	17.7 (0)	15.7 (0)	7.0 ab (36)	3.0 b (60)	1.8 (81)
RTSA 721 + Scrimmage ¹	100 + 5.6 ml per gal	Basal trunk spray	11.2	10.8 (40)	13.2 (21)	13.0 (3)	6.7 ab (37)	1.7 b (77)	2.0 (72)
Transect 70 WSP	0.6 oz per 17” DBH	Soil injection	11.5	12.7 (32)	11.3 (34)	12.0 (13)	1.7 b (84)	1.0 b (87)	1.3 (84)
Water	-	Drench	10.0	16.2 (0)	15.0 (0)	12.0 (0)	9.5 a (0)	6.5 a (0)	2.7 (74)

¹Scrimmage is a nonionic and organosilicone surfactant added to basal trunk spray solution at the request of the registrant.

²Data were $\log(x+0.1)$ transformed before ANOVA under CRD at $\alpha = 0.05$. Degrees-of-freedom: d.f.(trt) = 3, d.f.(error) = 20. Means were separated by Fisher’s LSD at $\alpha = 0.05$.

Efficacy Summary by Active Ingredient

A16901B. This product applied as drench provided poor control of camellia scale in one experiment, mixed results on Euonymus scale in three experiments, and on false oleander scale in two experiments, and mediocre control of pine needle scale in two experiments. On cottony cushion scale, it provided excellent control in one, but no to mediocre efficacy in three other experiments. It had excellent control of gloomy scale in one experiment.

Aloft SC/Celero 16WSG. Celero provided poor control of cottony cushion scale and mixed results in 3 experiments on Florida wax scale with minimal to excellent control of nymphs and adults. Aloft provided good control of euonymus scale and holly pit scale, but poor control of armored scale and oystershell scale.

Altus/BYI-2960 200 SL. This product applied foliar provided poor and excellent control of tea scale in two experiments; a third experiment was inconclusive. An experiment on false oleander scale on potted *Aucuba japonica* showed Altus and all other treatments, including the standards (Distance, Talus and Tristar), providing poor control because application timing might have been too early to provide adequate control; similarly, it showed poor activity in another trial. Results of an experiment on crapemyrtle indicate reliable suppression of crapemyrtle bark scale (*Acanthococcus lagerstroemiae*). It provided good control of cycad scale (*Aulacaspis yasumatsui*) in a sago palm trial, and excellent control of lobate lac scale (*Paratrichodorus pseudolabata*) in a hibiscus trial. Good efficacy for hala scale.

Azanguard. An experiment on false oleander scale on potted *Aucuba japonica* showed Azanguard and all other treatments, including the standards (Distance, Talus and Tristar), providing poor control because application timing might have been too early to provide adequate control; similarly, it showed poor activity in another trial. It provided poor control of cycad scale (*Aulacaspis yasumatsui*) in a sago palm trial, and of lobate lac scale (*Paratrichodorus pseudolabata*) in a hibiscus trial. Little efficacy for Hala scale.

Botanigard ES. This biological product provided no control of elongate hemlock scale and cryptomeria scale in one experiment on Frasier fir.

Bountify/MBI 306. Bountify provided no control of crapemyrtle bark scale in two experiments. Some reduction in populations were observed for hemispherical scale.

BW133. This product provided poor control of crapemyrtle bark scale.

BW238. Both formulations (ES and WP) of this product provided poor control of crapemyrtle bark scale.

Discus. In one experiment, Discus foliar provided good control of Fletcher scale on yew.

Distance 0.86E. Distance generally provided excellent control of false oleander scale, gloomy scale, pine needle scale, magnolia white scale, and camellia scale, good to excellent control of tea scale and euonymus scale, good control of Florida wax scale, mixed efficacy on cottony cushion scale, and poor control of Fletcher scale, armored scale, false Florida red scale, holly pit scale and calico scale. Results of a pine needle scale experiment were inconclusive. Results of an experiment on crapemyrtle indicate reliable suppression of crapemyrtle bark scale (*Acanthococcus lagerstroemiae*).

Flagship 0.22G/25WG. Flagship foliar at both rates provided excellent control of elongate hemlock scale and cryptomeria scale, mediocre to good control of cottony maple scale, and poor control of armored scale, false oleander scale, and oystershell scale. On Florida wax scale, overall control was excellent although mixed results were obtained in 3 experiments, with good control of nymphs and excellent control of adults at both rates in one experiment, minimal impact on nymphs and excellent control of adults at both rates in another experiment, and minimal impact on adults and excellent control of nymphs at the higher rate in a third experiment. Better control of Fletcher scale was obtained with banded vs. foliar application. Euonymus scale control with foliar application was variable - good in a 2005, two 2009 and a 2010 experiments, mediocre in a 2004 and another 2009 experiment and poor in a 2010 experiment. Drench application provided excellent control of false Florida red scale but poor control of pine needle scale in two experiments, and of camellia, false oleander and holly pit scales in single experiments. On cottony cushion scale, foliar, drench and soil broadcast application provided good to excellent control. Flagship 0.22G applied broadcast provided excellent control of false oleander scale in one experiment, poor and good control of cottony cushion scale, and poor control of pine needle scale in single experiments. On gloomy scale, Flagship applied broadcast or drench provided excellent control.

GF-2626 1SC. GF-2626 foliar provided excellent control of false oleander scale, mediocre control of pine needle scale, and poor and excellent control of cottony cushion scale, in single experiments.

ISM-555. This product provided good to excellent control of crapemyrtle bark scale in two experiments. Great control of hemispherical scale

Kontos/Movento 240SC. This product provided mixed results on euonymus scale (poor, mediocre, good and excellent) in single experiments. It provided excellent control of gloomy scale, tea scale and camellia scale, but mediocre control of calico scale, and no control of elongate hemlock scale, cryptomeria scale, false oleander scale and pine needle scale in single experiments. Kontos applied foliar provided good to excellent control of pine needle scale, and poor to excellent control of cottony cushion scale in three experiments; when applied drench, it was poor on cottony cushion scale in a single experiment.

KOC22018-8. This product applied foliar provided provided poor control of cycad scale (*Aulacaspis yasumatsui*) in a sago palm trial. It showed poor activity on false oleander scale in an aucuban experiment. Some efficacy for Hala scale.

Mainspring 200SC. This product applied as drench provided good to excellent control of tea scale in six experiments; a seventh experiment was inconclusive. In single experiments, excellent control of magnolia white scale, good control of calico scale, poor and excellent control of euonymus scale, and poor control of camellia scale were obtained. When applied foliar, Mainspring provided good control of tea scale in one experiment. Little impact observed for hemispherical scale.

MBI 203. Great efficacy 14 DAT for crapemyrtle bark scale, but no impact on hemispherical scale

MOI 201. In one Carolina silverbell experiment, MOI 201 foliar provided no control of oystershell scale.

Pradia/IKI-3326. An experiment on false oleander scale on potted *Aucuba japonica* showed

IKI-3326 and all other treatments, including the standards (Distance, Talus and Tristar), providing poor control because application timing might have been too early to provide adequate control; similarly, it showed poor activity in another trial. It provided poor control of cycad scale (*Aulacaspis yasumatsui*) in a sago palm trial. Good control of lobate lac scale (*Paratrichodorus pseudolabata*) in a hibiscus trial was obtained with 12 fl oz, but not with 16.5 fl oz, in a hibiscus trial. Little efficacy for hala scale.

Rycar/Rycar20SC. Rycar foliar provided excellent control of gloomy scale and pine needle scale, good to excellent control of cottony cushion scale, poor to good control of euonymus scale, and poor control of armored scale, false Florida red scale, false oleander scale and holly pit scale.

RTSA-721. RTSA 721 provided good efficacy for magnolia scale as a basal spray or soil drench. Good to excellent efficacy was observed.

Safari 2G/20SG/Transect 70WSP. Safari applied as a trunk spray provided good control of elongate hemlock scale, Cryptomeria scale, and euonymus scale in single experiments. Control of gloomy scale from Safari or Transect applied as trunk spray or soil treatment was excellent, but control of calico scale was mediocre; Pentrabark slightly improved performance. Excellent control of calico scale was obtained when it was applied as a drench in one experiment. Safari at both rates foliar or drench provided excellent control of elongate hemlock scale and cryptomeria scale, mediocre to good control of Fletcher scale and euonymus scale. On cottony cushion scale, Safari applied as drench or soil broadcast provided excellent control in two experiments but poor control in another experiment; a fourth experiment that was terminated early showed poor control with foliar or drench applications. Drench application provided excellent control of euonymus scale, false Florida red scale, Florida wax scale, and tea scale, variable results on false oleander scale and pine needle scale, and poor control of armored scale and camellia scale. On oystershell scale, Safari at both rates provided excellent control when applied as drench but poor control when applied foliar. Cottony maple scale control was poor to mediocre with foliar, and none to poor with drench application. Holly pit scale efficacy with drench or soil surface application was poor in a single experiment. Results of an experiment on crapemyrtle indicate reliable suppression of crapemyrtle bark scale (*Acanthococcus lagerstroemiae*).

Sarisa/IKI-3106. This product applied foliar provided good to excellent control of tea scale in 3 experiments; a fourth experiment was inconclusive. Poor control of pine needle scale was obtained in one experiment. An experiment on false oleander scale on potted *Aucuba japonica* showed IKI-3106 and all other treatments, including the standards (Distance, Talus and Tristar), providing poor control because application timing might have been too early to provide adequate control; similarly, it showed poor activity in another trial. It provided good control of lobate lac scale (*Paratrichodorus pseudolabata*) in a hibiscus trial, but poor control of cycad scale (*Aulacaspis yasumatsui*) in a sago palm trial. Little efficacy for hala scale.

SP3014. Good efficacy for crapemyrtle bark scale 4 weeks after application. Good control of hemispherical scale

Talus 40SC/70DF. Talus provided excellent control of elongate hemlock scale, cryptomeria scale, oystershell scale, gloomy scale, magnolia white scale and camellia scale. Excellent control of pine needle scale and poor to excellent control of cottony cushion scale was also obtained with Talus 70DF in three experiments. It provided good to excellent control of euonymus scale and tea scale, and good control of Fletcher scale. Variable efficacy on Florida wax scale and false

oleander scale, and poor control of cottony maple scale, armored scale, false Florida red scale, and holly pit scale were obtained. Results of an experiment on crapemyrtle indicate reliable suppression of crapemyrtle bark scale (*Acanthococcus lagerstroemiae*). It provided good control of cycad scale (*Aulacaspis yasumatsui*) in a sago palm trial, and excellent control of lobate lac scale (*Paratrichodorus pseudolabata*) in a hibiscus trial. Good efficacy for Hala scale, and good control of hemispherical scale

TetraCURB. Two formulations (Concentrate and Organic) of this product applied as foliar sprays provided provided poor control of cycad scale (*Aulacaspis yasumatsui*) and poor activity on false oleander scale. Little impact on Hala scale, but great control of hemispherical scale

Transtech WSP. Good efficacy was observed for Magnolia scale. Transtech demonstrated excellent efficacy for crapemyrtle bark scale.

TriStar 30SG/70WSP. TriStar provided excellent control of elongate hemlock scale and cryptomeria scale, gloomy scale, and pine needle scale. For Florida wax scale, overall control was excellent although mixed results were obtained in 3 experiments, with good control of nymphs and excellent control of adults at both rates in one experiment, minimal impact on nymphs and excellent control of adults at both rates in another experiment, and minimal impact on adults and excellent control of nymphs in a third experiment. Good control of Fletcher scale was obtained with the higher rate, and of cottony cushion scale with both rates. It provided variable, but generally mediocre, control of euonymus scale. Efficacy was generally none to mediocre on cottony maple scale, armored scale, camellia scale, false Florida red scale, false oleander scale, Florida red scale, holly pit scale, and oystershell scale.

V-10433. V-10433 foliar provided little control of crapemyrtle bark scale in two experiments. Little impact on hemispherical scale

Velifer. Good control of hemispherical scale

Ventigra. This product applied foliar provided good to excellent control of tea scale in three experiments; a fourth experiment was inconclusive. An experiment on false oleander scale on potted *Aucuba japonica* showed Ventigra and all other treatments, including the standards (Distance, Talus and Tristar), providing poor control because application timing might have been too early to provide adequate control; similarly, it showed poor activity in another trial. It provided good control of cycad scale (*Aulacaspis yasumatsui*) in a sago palm trial, and of lobate lac scale (*Paratrichodorus pseudolabata*) in a hibiscus trial. Little efficacy for hala scale, but good control of hemispherical scale.

XXpire 40WG. XXpire foliar provided excellent control of magnolia white scale, false oleander scale, tea scale and camellia scale, good control of armored scale, mediocre control of pine needle scale, poor and excellent control of cottony cushion scale and euonymus scale, and poor to good control of calico scale.

Please see **Error! Reference source not found.** for a list of all researchable studies and the summary of experiments conducted from 2004 to 2022.

Phytotoxicity

No phytotoxicity was observed with any treatments.

Table 90. Summary of Efficacy by Product for Scale

Note: Table entries are sorted by crop Latin name. Only those experiments received by 6/8/2023 are included in the table below.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
30224	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Sacred Bamboo (<i>Nandina domestica</i>) 'Harbour Dwarf'	Field Container	Frank	NC	2011	Drench	Significantly reduced adults and immatures with 5 oz per 100 gal applied once; comparable to horticultural oil.
32151	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Sacred Bamboo (<i>Nandina domestica</i>) 'Harbour Dwarf'	Greenhouse	Frank	NC	2012	Foliar	Did not significantly reduce immatures with 5 and 10 oz per 100 gal applied once.
30296	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Cheesewood (<i>Pittosporum</i> sp.) <i>P. tobira</i> 'Verigata'	Field In-Ground	Chong	SC	2011	Drench	Did not significantly reduce immatures with 10 oz per 100 gal.
30452	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Cheesewood (<i>Pittosporum</i> sp.) <i>P. tobira</i> cv. 'variegata'	Field Container	Chong	SC	2012	Drench	No consistent and significant reduction of scale population with 5 and 10 oz per 100 gal; comparable to standard paraffinic oil.
30079	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Camelia Scale (<i>Lepidosaphes camelliae</i>)	Camellia (<i>Camellia japonica</i>)	Commercial Landscape	Chong	SC	2010	Drench	Did not significantly reduce camellia scale population at 10 oz per 100 gal; comparable to all other treatments including the standard Orthene; no injury observed.
30234	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Gloomy Scale (<i>Melanaspis tenebricosa</i>)	Maple (<i>Acer</i> sp.) <i>A. rubrum</i>	Field In-Ground	Frank	NC	2011	Drench	Excellent control of adults and immatures with 5 oz per 100 gal applied once; comparable to standard paraffin oil.
31285	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Scale, Magnolia (<i>Neolecanium cornuparvum</i>)	Sweet Bay (<i>Magnolia virginiana</i>) M.	Field In-Ground	Braman	GA	2012	Foliar	Great control of false oleander scale immatures with 5 and 10 oz per 100

				grandiflora, 'Little Gem'						gal; comparable to Orthene.
29765	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Nielsen	OH	2010	Drench	Poor efficacy at 10 oz per 100 gal.
29765	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Nielsen	OH	2011	Drench	Poor efficacy with 10 oz per 100 gal.
29625	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora)	Commercial Landscape	Chong	SC	2010	Drench	Charleston, SC: Did not significantly reduce false oleander scale population at 10 oz per 100 gal; comparable to the standard Orthene; no injury observed.
29638	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Frank	NC	2010	Drench	Excellent control with 5 oz per 100 gal; comparable to horticultural oil.
29638	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Green Spire'	Field Container	Gilrein	NY	2011	Drench	Did not significantly reduce population with 5 oz per 100 gal applied once.
29638	A16901B 45WG (Thiamethoxam + cyantraniliprole)	IRAC 4A + IRAC 28	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Moonshadow'	Field Container	Potter	KY	2010	Drench	No significant reduction of adult scales with 5 oz per 100 gal.
31476	Acelepryn (Dupont) (Chlorantraniliprole)	IRAC 28	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos inermis	Commercial Landscape	Sadof	IN	2011	Foliar	Poor efficacy with 4 fl oz per 100 gal.
29264	Acephate Pro 75 WSP (Acephate)	IRAC 1B	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Microphylla'	Field Container	Frank	NC	2009	Foliar	Excellent control at 0.67 lb per 100 gal
28692	Aloft SC (Clothianadin + bifenthrin)	IRAC 4A + IRAC 3	Scale, Holly Pit (Asterolecanium puteanum)	Holly (Ilex sp.) 'East Palatka'	Field In- Ground	Buss	FL	2009	Foliar	Significantly reduced number of immatures at 10 fl oz per 100 gal; comparable to Orthene.

										56% control with HendersonsTilton 6 WAT.
28879	Aloft SC (Clothianadin + bifenthrin)	IRAC 4A + IRAC 3	Scale, Oystershell (Diaspidiotus ostreiformis)	Silverbell Carolina (Halesia carolina var. carolina)	Field In-Ground	Nielsen	OH	2008	Sprenc	Very low infestation; poor control at 5 and 10 fl oz per 100 gal
28130	Aloft SC (Clothianadin + bifenthrin)	IRAC 4A + IRAC 3	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2008	Sprenc	Experiment 1: Did not significantly reduce scale population at 5 and 10 fl oz per 100 gal; similar to Orthene std; untreated population very low and no statistical differences were observed.
28130	Aloft SC (Clothianadin + bifenthrin)	IRAC 4A + IRAC 3	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2009	Sprenc	Did not significantly reduce scale population at 10 fl oz per 100 gal; similar to Orthene std; very low non treated population so no statistical significance.
29978	Aloft SC (Clothianadin + bifenthrin)	IRAC 4A + IRAC 3	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In-Ground	Nielsen	OH	2010	Sprenc	Excellent efficacy at 10 fl oz per 100 gal.
29583	Aloft SC (Clothianadin + bifenthrin)	IRAC 4A + IRAC 3	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Microphylla'	Field Container	Ludwig	TX	2008	Foliar	Good efficacy at 5 and 10 fl oz per 100 gal.
27834	Aloft SC (Clothianadin + bifenthrin)	IRAC 4A + IRAC 3	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Coloratus'	Field In-Ground	Nielsen	OH	2008	Sprenc	Good efficacy at 10 fl oz per 100 gal.
34210	Altus (Flupyradifurone)	IRAC 4D	Scale, Cycad (Aulacaspis yasumatsui)	Sago Palm (Cycas revoluta)	Field Container	Dale	FL	2019	Foliar	Good control of adults but mediocre control of nymphs with 14 fl oz per 100 gal applied twice biweekly.
33575	Altus (Flupyradifurone)	IRAC 4D	Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia)	Field Container	Vafaie	TX	2018	Foliar	Data had too much variation to provide reliable results.

				indica) 'Natchez'						Researcher's preliminary conclusions demonstrate reliable scale suppression with Altus at 10.5 fl oz per 100 gal, comparable to the standard Distance.
32353	Altus (Flupyradifurone)	IRAC 4D	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field In-Ground	Braman	GA	2015	Foliar	Good and excellent control with 2.7 and 5.4 fl oz per 100 gal applied 3 times weekly.
32845	Altus (Flupyradifurone)	IRAC 4D	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.) 'Nellie Stevens'	Field Container	Chong	SC	2015	Foliar	Poor and good efficacy with 2.7 and 5.4 fl oz per 100 gal applied 3 times weekly; inferior to Distance.
32845	Altus (Flupyradifurone)	IRAC 4D	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.)	Field Container	Frank	NC	2015	Foliar	Did not significantly reduce number of adults and nymphs with 2.7 and 5.4 fl oz per 100 gal applied twice biweekly. Protocol required weekly application.
33549	Altus (Flupyradifurone)	IRAC 4D	Lobate Lac Scale (Paratachardina pseudolobata)	Rosemallow (Hibiscus sp.) H. rosa-sinensis 'Dainty White'	Field Container	Cheng	HI	2018	Foliar	Excellent efficacy with 14 fl oz per 100 gal and no phytotoxicity.
32287	Altus (Flupyradifurone)	IRAC 4D	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In-Ground	Persad	OH	2015	Foliar	Mediocre control with 2.7 and 5.4 fl oz per 100 gal applied 3 times weekly.
33850	Altus (Flupyradifurone)	IRAC 4D	False Oleander Scale (Pseudaulacaspis cockerelli)	Japanese Laurel (Aucuba japonica)	Field Container	Held	AL	2018	Foliar	Poor control with 14 fl oz per 100 gal. Researcher commented that application timing used in this trial might have been too early to provide adequate control for this insect.
34250	Altus (Flupyradifurone)	IRAC 4D	False Oleander Scale (Pseudaulacaspis cockerelli)	Aucuba (Aucuba sp.)	Field Container	Held	AL	2019	Foliar	Weak efficacy through 1 month after initial treatment with 14 fl oz per 100 gal applied twice biweekly, but good efficacy 6 months after treatment.

33829	Altus (Flupyradifurone)	IRAC 4D	Scale, Hala (Thysanococcus pandani)	Hala (Pandanus sp.)	Field Container	Cheng	HI	2019	Foliar	Good efficacy with 14 fl oz per 100 gal applied twice weekly. No phytotoxicity.
32340	Altus (Flupyradifurone)	IRAC 4D	Euonymus Scale (Unaspis euonymi)	Wintercreeper (Euonymus fortunei)	Field Container	Potter	KY	2015	Foliar	Scale failed to establish; no usable data were able to be collected
28974	Arena 50WDG (Clothianadin)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) I. cornuta 'Needlepoint'	Commercial Landscape	Held (MSU)	TN	2009	Drench	Excellent control at 2.4 g per ft height applied for first or second generation.
29847	Arena 50WDG (Clothianadin)	IRAC 4A	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos inermis	Commercial Landscape	Sadof	IN	2010	Drench	Good efficacy with 3.6 g ai per inch DBH.
30080	Arena 50WDG (Clothianadin)	IRAC 4A	Camelia Scale (Lepidosaphes camelliae)	Camellia (Camellia japonica)	Commercial Landscape	Chong	SC	2010	Drench	Did not significantly reduce camellia scale population at 2.4 g per ft height; comparable to all other treatments including the standard Orthene; no injury observed.
29694	Arena 50WDG (Clothianadin)	IRAC 4A	False Oleander Scale (Pseudaulacaspis cockerelli)	Sweet Bay (Magnolia virginiana)	Commercial Landscape	Chong	SC	2010	Drench	Charleston, SC: Significantly reduced false oleander scale population at 4.8 g per in dbh; better than the standard Orthene; no injury observed.
34211	AzaGuard (Azadirachtin)	IRAC UN	Scale, Cycad (Aulacaspis yasumatsui)	Sago Palm (Cycas revoluta)	Field Container	Dale	FL	2019	Foliar	No significant control of nymphs and adults with 16 fl oz per 100 gal applied 5 times weekly.
33576	AzaGuard (Azadirachtin)	IRAC UN	Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica) 'Natchez'	Field Container	Vafaie	TX	2018	Foliar	Data had too much variation to provide reliable results.
32407	AzaGuard (Azadirachtin)	IRAC UN	Scale, Tea (Fiorinia theae)	Sasanqua camellia (Camellia sasanqua) 'Mountain Snow'	Field Container	Chen	LA	2014	Foliar	Significantly reduced infestation with 20 fl oz per 100 gal applied once; comparable to standard SuffOil-X.
33545	AzaGuard (Azadirachtin)	IRAC UN	Lobate Lac Scale (Paratachardina pseudolobata)	Rosemallow (Hibiscus sp.) H. rosa-sinensis 'Dainty White'	Field Container	Cheng	HI	2018	Foliar	Efficacy with 16 and 32 fl oz per 100 gal inferior to imidacloprid. No phytotoxicity.

33851	AzaGuard (Azadirachtin)	IRAC UN	False Oleander Scale (Pseudaulacaspis cockerelli)	Japanese Laurel (Aucuba japonica)	Field Container	Held	AL	2018	Foliar	Poor control with 16 and 32 fl oz per 100 gal. Researcher commented that application timing used in this trial might have been too early to provide adequate control for this insect.
34251	AzaGuard (Azadirachtin)	IRAC UN	False Oleander Scale (Pseudaulacaspis cockerelli)	Aucuba (Aucuba sp.)	Field Container	Held	AL	2019	Foliar	Poor efficacy through 1 month after initial treatment with 16 fl oz per 100 gal applied 5 times weekly, but good efficacy 6 months after treatment.
32401	AzaGuard (Azadirachtin)	IRAC UN	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora) 'Little Gem'	Field Container	Chen	LA	2014	Foliar	Significantly reduced infestation with 20 fl oz per 100 gal applied once; much inferior to standard SuffOil-X.
33830	AzaGuard (Azadirachtin)	IRAC UN	Scale, Hala (Thysanococcus pandani)	Hala (Pandanus sp.)	Field Container	Cheng	HI	2019	Foliar	Poor efficacy with 16 fl oz per 100 gal applied once. No phytotoxicity.
28386	Botanigard 22WP (Beauveria bassiana Strain GHA)	IRAC UNF	Scale, Elongate Hemlock (Fiorinia externa)	Fir, Fraser (Abies fraseri)	Field In- Ground	Cowles	CT	2008	Foliar	No control with 64 oz per acre.
34178	Bountify (MBI 306) (Burkholderia rinojensis strain A396)	FRAC NC & IRAC UNB	Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica)	Field Container	Held	AL	2020	Foliar	No control with 5 fl oz per 100 gal applied twice weekly.
34178	Bountify (MBI 306) (Burkholderia rinojensis strain A396)	FRAC NC & IRAC UNB	Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica) 'Natchez'	Field Container	Held	AL	2021	Foliar	Poor efficacy on crawlers and adults when applied at 2.5 fl oz per 100 gal twice at one week interval.
35084	Bountify (MBI 306) (Burkholderia rinojensis strain A396)	FRAC NC & IRAC UNB	Scale, Hemispherical; brown shield (Saissetia coffeae)	Coontie palm (Zamia integrifolia)	Field Container	Dale	FL	2022	Foliar	Mediocre reduction in populations 14 DAT with 20 fl oz per 100 oz; excellent efficacy for a re- establishing population at 112 DAT.
34173	BW133 (BW133)	FRAC NC	Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica)	Field Container	Held	AL	2020	Foliar	No control with 5 lb per 100 gal applied 3 times weekly.

34174	BW238 ES (BW238 ES)		Crape Myrtle Bark Scale (<i>Eriococcus lagerstroemia</i>)	Crape Myrtle (<i>Lagerstroemia indica</i>)	Field Container	Held	AL	2020	Foliar	No control with 2 qt per 100 gal applied 3 times weekly.
34175	BW238 WP (BW238 WP)		Crape Myrtle Bark Scale (<i>Eriococcus lagerstroemia</i>)	Crape Myrtle (<i>Lagerstroemia indica</i>)	Field Container	Held	AL	2020	Foliar	No control with 2 lb per 100 gal applied 3 times weekly.
25729	Celero 16WSG (Clothianadin)	IRAC 4A	Florida Wax Scale (<i>Ceroplastes floridensis</i>)	Holly (<i>Ilex</i> sp.) 'China Doll'	Field Container	Ludwig	TX	2005	Foliar	Minimal impact on adults; some efficacy on nymphs at 14 DAT at 4 oz per 100 gal
25729	Celero 16WSG (Clothianadin)	IRAC 4A	Florida Wax Scale (<i>Ceroplastes floridensis</i>)	Holly (<i>Ilex</i> sp.) <i>I. cornuta</i> 'bufordii nana'	Field Container	Ludwig	TX	2005	Foliar	Minimal impact on nymphs; excellent efficacy on adults by 56 DAT at 4 oz per 100 gal
25773	Celero 16WSG (Clothianadin)	IRAC 4A	Florida Wax Scale (<i>Ceroplastes floridensis</i>)	Indian Hawthorn (<i>Rhaphiolepis indica</i>)	Field Container	Ludwig	TX	2005	Foliar	By 41 DAT, excellent efficacy on nymphs and on adults at 4 oz per 100 gal
25777	Celero 16WSG (Clothianadin)	IRAC 4A	Florida Red Scale (<i>Chrysomphalus aonidum</i>)	Holly, Chinese (<i>Ilex cornuta</i>) 'Dwarf Buford'	Field Container	Ludwig	TX	2005	Foliar	No significant control of nymphs and on adults at 4 oz per 100 gal probably due to cooler temperatures
25731	Celero 16WSG (Clothianadin)	IRAC 4A	Cottony Cushion Scale (<i>Icerya purchasi</i>)	<i>Ternstroemia</i> (<i>Ternstroemia</i> sp.) <i>T. gymnanthera</i>	Field Container	Ludwig	TX	2005	Foliar	Poor efficacy at 4 oz per 100 gallon rate
30589	Cygon 2E (Dimethoate)	IRAC 1B	Indian Wax Scale (<i>Ceroplastes ceriferus</i>)	Paperplant, Japanese Aralia (<i>Fatsia japonica</i>)	Greenhouse	Williams	AL	1977	Foliar	About 50% efficacy with 0.5 lb ai per 100 gal, with a population of mostly adult females and 2nd instar nymphs; no injury.
30583	Cygon 2E (Dimethoate)	IRAC 1B	Florida Wax Scale (<i>Ceroplastes floridensis</i>)	Camellia (<i>Camellia japonica</i>)	Field Container	Schalk	SC	1984	Trunk spray	No injury at 1, 2, and 4 inch band applied to truck; low population and no statistical differences among treatments.
30584	Cygon 2E (Dimethoate)	IRAC 1B	Scale, Elongate Hemlock (<i>Fiorinia externa</i>)	Camellia (<i>Camellia japonica</i>)	Field Container	Williams	AL	1983	Foliar	Good efficacy at 0.5 lb ai per 100 gal; no phytotoxicity.
30584	Cygon 2E (Dimethoate)	IRAC 1B	Scale, Elongate Hemlock (<i>Fiorinia externa</i>)	Camellia (<i>Camellia japonica</i>)	Field Container	Williams	AL	1983	Trunk spray	Good efficacy with 1 and 2 inch banding; no phytotoxicity.
08765	Cygon 2E (Dimethoate)	IRAC 1B	Scale, Tea (<i>Fiorinia theae</i>)	Camellia (<i>Camellia</i> sp.)	Greenhouse	Schalk	SC	1984	Trunk spray	Insufficient population to determine efficacy; no

										injury with 1, 2, and 4 inch banding on trunks.
30585	Cygon 2E (Dimethoate)	IRAC 1B	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field In-Ground	Schuder	IN	1984	Trunk spray	Excellent efficacy with 1 and 2 inch banding; no phytotoxicity.
30585	Cygon 2E (Dimethoate)	IRAC 1B	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Williams	AL	1983	Foliar	Good efficacy with 0.5 lb ai per 100 gal; no injury.
30585	Cygon 2E (Dimethoate)	IRAC 1B	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Williams	AL	1983	Trunk spray	Good efficacy with 1 and 2 inch banding; mortality within 1 month of second application at 2 inch banding rate.
25150	Diazinon 4E (Diazinon)	IRAC 1B	Winged Euonymus Scale (Lepidosaphes yanagicola)	Burning Bush (Euonymus alatus)	Field Container	Freiberger	NJ	2004	Foliar	Poor control at 8.96 oz per 100 gal; no injury observed.
00932	Diazinon 4E (Diazinon)	IRAC 1B	Euonymus Scale (Unaspis euonymi)	Winter Creeper (Euonymus radicans)	Field In-Ground	Schuder	IN	1984	Foliar	Excellent efficacy with 1 lb ai per 100 gal; no phytotoxicity.
25165	Discus (Imidacloprid + cyfluthrin)	IRAC 4A + IRAC 3A	Fletcher Scale (Parthenolecanium fletcheri)	Hybrid Yew (Taxus X media) Densiformis	Field In-Ground	Davis	MI	2004	Banded	Good efficacy with banded application.
25165	Discus (Imidacloprid + cyfluthrin)	IRAC 4A + IRAC 3A	Fletcher Scale (Parthenolecanium fletcheri)	Hybrid Yew (Taxus X media) Densiformis	Field In-Ground	Davis	MI	2004	Foliar	Good efficacy.
28693	Distance (Pyriproxyfen)	IRAC 7C	Scale, Holly Pit (Asterolecanium puteanum)	Holly (Ilex sp.) 'East Palatka'	Field In-Ground	Buss	FL	2009	Foliar	Did not reduce number of immatures at 12 fl oz per 100 gal. 0% control with HendersonsTilton 6 WAT.
25051	Distance (Pyriproxyfen)	IRAC 7C	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) 'Dwarf Buford'	Field Container	Ludwig	TX	2004	Foliar	Significant mortality 45 days with all rates (8, 16, 32 oz per 100 gal).
28685	Distance (Pyriproxyfen)	IRAC 7C	False Florida Red Scale (Chrysomphalus bifasciculatus)	Holly, Chinese (Ilex cornuta) 'Cassina'	Field In-Ground	Chong	SC	2009	Foliar	Good efficacy at 12 fl oz per 100 gal
33874	Distance (Pyriproxyfen)	IRAC 7C	Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia)	Field Container	Vafaie	TX	2018	Foliar	Data had too much variation to provide reliable results.

				indica) 'Natchez'						Researcher's preliminary conclusions demonstrate reliable scale suppression with the standard Distance.
30415	Distance (Pyriproxyfen)	IRAC 7C	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.)	Commercial Landscape	Sadof	IN	2012	Foliar	Carmel: Poor control of ovipositing adults with 12 fl oz per 100 gal.
32037	Distance (Pyriproxyfen)	IRAC 7C	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica) 'In the Pink'	Field Container	Arthurs (UF)	FL	2014	Foliar	Excellent control with 12 fl oz per 100 gal + Capsil applied twice; comparable to SuffOil X.
32037	Distance (Pyriproxyfen)	IRAC 7C	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field Container	Chen	LA	2015	Foliar	Great control with 12 oz per 100 gal; comparable to Ultra-Pure Oil.
32404	Distance (Pyriproxyfen)	IRAC 7C	Scale, Tea (Fiorinia theae)	Sasanqua camellia (Camellia sasanqua) 'Mountain Snow'	Field Container	Chen	LA	2014	Foliar	Significantly reduced infestation with 12 fl oz per 100 gal applied twice; comparable to standard SuffOil-X.
32848	Distance (Pyriproxyfen)	IRAC 7C	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.) 'Nellie Stevens'	Field Container	Chong	SC	2015	Foliar	Good efficacy with 12 fl oz per 100 gal applied twice every 21 days; one of 3 most effective treatments.
32848	Distance (Pyriproxyfen)	IRAC 7C	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.)	Field Container	Frank	NC	2015	Foliar	Did not significantly reduce number of adults and nymphs with 12 fl oz per 100 gal applied once.
30225	Distance (Pyriproxyfen)	IRAC 7C	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Field Container	Frank	NC	2011	Foliar	Significantly reduced adults and immatures with 12 fl oz per 100 gal applied twice; comparable to horticultural oil.
32154	Distance (Pyriproxyfen)	IRAC 7C	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Greenhouse	Frank	NC	2012	Foliar	Significantly reduced immatures with 12 fl oz per 100 gal applied twice; comparable to horticultural oil.
30297	Distance (Pyriproxyfen)	IRAC 7C	Cottony Cushion Scale (Icerya purchasi)	Cheesewood (Pittosporum sp.) P. tobira 'Verigata'	Field In- Ground	Chong	SC	2011	Foliar	Significantly reduced immatures with 12 fl oz per 100 gal applied twice; comparable to the standard Orthene.

30453	Distance (Pyriproxyfen)	IRAC 7C	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Cheesewood (<i>Pittosporum</i> sp.) <i>P. tobira</i> cv. 'variegata'	Field Container	Chong	SC	2012	Foliar	No consistent and significant reduction of scale population with 12 fl oz per 100 gal; comparable to standard paraffinic oil.
30081	Distance (Pyriproxyfen)	IRAC 7C	Camelia Scale (<i>Lepidosaphes camelliae</i>)	<i>Camellia japonica</i> C. <i>japonica</i> and <i>C. sasanqua</i>	Commercial Landscape	Chong	SC	2014	Foliar	Consistent and high efficacy with 12 fl oz per 100 gal applied twice every 3 weeks; comparable to the standard paraffinic oil.
25151	Distance (Pyriproxyfen)	IRAC 7C	Winged Euonymus Scale (<i>Lepidosaphes yanagicola</i>)	Burning Bush (<i>Euonymus alatus</i>)	Field Container	Freiberger	NJ	2004	Foliar	Good efficacy at 32 oz per 100 gal; lower rates were not effective
28136	Distance (Pyriproxyfen)	IRAC 7C	Wax Myrtle Scale (<i>Melanaspis deklei</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Commercial Landscape	Chong	SC	2008	Foliar	Experiment 2: Did not significantly reduce scale population at 12 fl oz per 100 gal; similar to Sunspray Ultrafine std
28136	Distance (Pyriproxyfen)	IRAC 7C	Wax Myrtle Scale (<i>Melanaspis deklei</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Commercial Landscape	Chong	SC	2009	Foliar	Experiment 2: Significantly reduced scale population at 12 fl oz per 100 gal; similar to paraffinic oil std; very low non treated population so no statistical significance.
30235	Distance (Pyriproxyfen)	IRAC 7C	Gloomy Scale (<i>Melanaspis tenebricosa</i>)	Maple (<i>Acer</i> sp.) <i>A. rubrum</i>	Field In-Ground	Frank	NC	2011	Foliar	Excellent control of adults and immatures with 12 fl oz per 100 gal applied twice; comparable to standard paraffinic oil.
30235	Distance (Pyriproxyfen)	IRAC 7C	Gloomy Scale (<i>Melanaspis tenebricosa</i>)	Maple (<i>Acer</i> sp.) <i>A. rubrum</i>	Field In-Ground	Frank	NC	2014	Foliar	Data inconclusive because there were no significant differences between treatments, including untreated check.
31290	Distance (Pyriproxyfen)	IRAC 7C	Scale, Magnolia (<i>Neolecanium cornuparvum</i>)	Sweet Bay (<i>Magnolia virginiana</i>) M. <i>grandiflora</i> , 'Little Gem'	Field In-Ground	Braman	GA	2012	Foliar	Excellent control of false oleander scale immatures with 12 fl oz per 100 gal; comparable to Orthene.
25164	Distance (Pyriproxyfen)	IRAC 7C	Fletcher Scale (<i>Parthenolecanium fletcheri</i>)	Hybrid Yew (<i>Taxus X</i>)	Field In-Ground	Davis	MI	2004	Foliar	Poor efficacy.

				media) Densiformis						
29766	Distance (Pyriproxyfen)	IRAC 7C	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Nielsen	OH	2010	Foliar	Excellent efficacy at 12 fl oz per 100 gal.
29766	Distance (Pyriproxyfen)	IRAC 7C	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. strobus	Field In- Ground	Sadof	IN	2015	Foliar	Significant efficacy on immatures and adults with 12 fl oz per 100 gal.
33853	Distance (Pyriproxyfen)	IRAC 7C	False Oleander Scale (Pseudaulacaspis cockerelli)	Japanese Laurel (Aucuba japonica)	Field Container	Held	AL	2018	Foliar	Poor control with 12 fl oz per 100 gal. Researcher commented that application timing used in this trial might have been too early to provide adequate control for this insect.
33853	Distance (Pyriproxyfen)	IRAC 7C	False Oleander Scale (Pseudaulacaspis cockerelli)	Japanese Laurel (Aucuba japonica)	Field Container	Held	AL	2019	Foliar	Poor efficacy with 12 fl oz per 100 gal applied twice every 3 weeks.
32398	Distance (Pyriproxyfen)	IRAC 7C	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora) 'Little Gem'	Field Container	Chen	LA	2014	Foliar	Excellent control with 12 fl oz per 100 gal applied twice; comparable to standard SuffOil-X.
29627	Distance (Pyriproxyfen)	IRAC 7C	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora)	Commercial Landscape	Chong	SC	2010	Foliar	Litchfield, SC: Significantly reduced false oleander scale population at 12 fl oz per 100 gal; comparable to the standard Paraffinic oil; no injury observed.
28947	Distance (Pyriproxyfen)	IRAC 7C	White Peach Scale (Pseudaulacaspis pentagona)	Holly, Blue (Ilex x meserveae)	Field In- Ground	Kunkel	DE	2009	Foliar	Mortality in untreated controls was high; no conclusions can be drawn.
28870	Distance (Pyriproxyfen)	IRAC 7C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Braman	GA	2014	Foliar	Good to excellent control with 12 fl oz per 100 gal applied twice at 14-day interval.
28870	Distance (Pyriproxyfen)	IRAC 7C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Microphylla'	Field Container	Frank	NC	2009	Foliar	Excellent control at 12 fl oz per 100 gal; equal to Acephate

28870	Distance (Pyriproxyfen)	IRAC 7C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Frank	NC	2010	Foliar	Excellent control with 12 fl oz per 100 gal; slower acting than horticultural oil.
28870	Distance (Pyriproxyfen)	IRAC 7C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Green Spire'	Field Container	Gilrein	NY	2011	Foliar	Excellent control with 12 fl oz per 100 gal applied twice.
28870	Distance (Pyriproxyfen)	IRAC 7C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Radicans'	Field Container	Kunkel	DE	2011	Foliar	Significantly increased mortality with 12 fl oz per 100 gal applied once; comparable to horticultural oil applied twice.
28870	Distance (Pyriproxyfen)	IRAC 7C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Microphylla'	Field Container	Ludwig	TX	2008	Foliar	Fair to good efficacy at 12 fl oz per 100 gal.
29980	Distance (Pyriproxyfen)	IRAC 7C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Coloratus'	Field In- Ground	Nielsen	OH	2008	Foliar	Good efficacy at 12 fl oz per 100 gal.
28870	Distance (Pyriproxyfen)	IRAC 7C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'SunSpot'	Field Container	Nielsen	OH	2009	Foliar	Excellent control at 12 fl oz per 100 gal
28870	Distance (Pyriproxyfen)	IRAC 7C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Moonshadow'	Field Container	Potter	KY	2010	Foliar	Significantly reduced 1st generation adult scales with 12 fl oz per 100 gal; better than horticultural oil.
28870	Distance (Pyriproxyfen)	IRAC 7C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei	Field Container	Potter	KY	2014	Foliar	Did not reduce scales with 12 fl oz per 100 gal applied at crawler stage and 3 weeks later.

				'Emerald N Gold'						
31477	DPX-HGW86 (Cyantraniliprole)	IRAC 28	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos inermis	Commercial Landscape	Sadof	IN	2011	Foliar	Poor efficacy with 4 fl oz per 100 gal.
25166	Dursban Pro (Chlorpyrifos)	IRAC 1B	Fletcher Scale (Parthenolecanium fletcheri)	Hybrid Yew (Taxus X media) Densiformis	Field In-Ground	Davis	MI	2004	Foliar	Good efficacy.
30226	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Field Container	Frank	NC	2011	Broadcast	Significantly reduced adults and immatures with 30 g per plant applied once; comparable to horticultural oil.
32152	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Greenhouse	Frank	NC	2012	Broadcast	Significantly reduced immatures with 40 g per item; comparable to horticultural oil.
30298	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Cottony Cushion Scale (Icerya purchasi)	Cheesewood (Pittosporum sp.) P. tobira 'Verigata'	Field In-Ground	Chong	SC	2011	Broadcast	Significantly reduced immatures with 227 g per ft applied once; comparable to the standard Orthene.
30454	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Cottony Cushion Scale (Icerya purchasi)	Cheesewood (Pittosporum sp.) P. tobira cv. 'variegata'	Field Container	Chong	SC	2012	Broadcast	No consistent and significant reduction of scale population with 60 g per pot; comparable to standard paraffinic oil.
30082	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Camelia Scale (Lepidosaphes camelliae)	Camellia (Camellia japonica)	Commercial Landscape	Chong	SC	2010	Broadcast	Did not significantly reduce camellia scale population at 227 g per ft height; comparable to all other treatments including the standard Orthene; no injury observed.
28918	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2009	Broadcast	Did not significantly reduce scale population at 227 g per ft shrub height; similar to Orthene std; very low non treated population so no statistical significance.

30236	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Gloomy Scale (Melanaspis tenebricosa)	Maple (Acer sp.) A. rubrum	Field In-Ground	Frank	NC	2011	Drench	Excellent control of adults and immatures with 4 g per ft ht applied once; comparable to standard paraffin oil.
31286	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Scale, Magnolia (Neolecanium cornuparvum)	Sweet Bay (Magnolia virginiana) M. grandiflora, 'Little Gem'	Field In-Ground	Braman	GA	2012	Broadcast	Excellent control of false oleander scale immatures with 114 and 227 g per ft ht; comparable to Orthene.
29767	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In-Ground	Jones	OH	2012	Broadcast	Significant, but poor, control with 227 g per ft height applied once.
29767	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In-Ground	Nielsen	OH	2010	Broadcast	No efficacy at 227 g per inch DBH.
29767	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In-Ground	Nielsen	OH	2011	Broadcast	No efficacy with 227 g per ft ht; some second generation eggs were present.
29628	Flagship 0.22G (Thiamethoxam)	IRAC 4A	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora)	Commercial Landscape	Chong	SC	2010	Broadcast	Charleston, SC: Significantly reduced false oleander scale population at 454 g per indbh, but not at 227 g; better than the standard Orthene; no injury observed.
28948	Flagship 0.22G (Thiamethoxam)	IRAC 4A	White Peach Scale (Pseudaulacaspis pentagona)	Holly, Blue (Ilex x meserveae)	Field In-Ground	Kunkel	DE	2009	Broadcast	Mortality in untreated controls was high; no conclusions can be drawn.
28871	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Microphylla'	Field Container	Frank	NC	2009	Broadcast	Good control but slow acting at 60 g per 3 gal container; inferior to Acephate
28871	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Frank	NC	2010	Broadcast	Excellent control with 60 g ai per 3 gal media; slower acting than horticultural oil.
28871	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E.	Field Container	Kunkel	DE	2011	Broadcast	Significantly increased mortality with 20 g per gal pot applied once; comparable to horticultural oil applied twice.

				fortunei 'Radicans'						
29087	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Coloratus'	Field In- Ground	Nielsen	OH	2008	Broadcast	Poor efficacy at 114 g per ft height.
28871	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'SunSpot'	Field Container	Nielsen	OH	2009	Top Dress	Not effective at 112 g per pot.
28871	Flagship 0.22G (Thiamethoxam)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Moonshadow'	Field Container	Potter	KY	2010	Broadcast	No significant reduction of adult scales with 40 g per 2 gal pot.
28694	Flagship 25WG (Thiamethoxam)	IRAC 4A	Scale, Holly Pit (Asterolecanium puteantum)	Holly (Ilex sp.) 'East Palatka'	Field In- Ground	Buss	FL	2009	Drench	Did not significantly reduce number of immatures at 4 g per inch dbh. 1% control with HendersonsTilton 6 WAT.
31139	Flagship 25WG (Thiamethoxam)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) I. cornuta 'Needlepoint'	Commercial Landscape	Held (MSU)	MS	2009	Drench	Excellent control at 3 g per ft height applied for first generation, less effective when applied for 2nd generation.
25052	Flagship 25WG (Thiamethoxam)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) 'Dwarf Buford'	Field Container	Ludwig	TX	2004	Foliar	Excellect efficacy at 2, 4, and 8 oz per 100 gal at 45DAT.
25052	Flagship 25WG (Thiamethoxam)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) 'China Doll'	Field Container	Ludwig	TX	2005	Foliar	Minimal impact on adults; great efficacy on nymphs at 14 DAT at 4 oz per 100 gal
25052	Flagship 25WG (Thiamethoxam)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) I. cornuta 'bufordii nana'	Field Container	Ludwig	TX	2005	Foliar	Minimal impact on nymphs; excellent efficacy on adults by 56 DAT at both 2 and 4 oz per 100 gal
25771	Flagship 25WG (Thiamethoxam)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Indian Hawthorn	Field Container	Ludwig	TX	2005	Foliar	By 41 DAT, good efficacy on nymphs and great

				(Rhaphiolepis indica)							efficacy on adults at both rates
25775	Flagship 25WG (Thiamethoxam)	IRAC 4A	Florida Red Scale (Chrysomphalus aonidum)	Holly, Chinese (Ilex cornuta) 'Dwarf Buford'	Field Container	Ludwig	TX	2005	Foliar		No significant control of nymphs and on adults at 2 and 4 oz per 100 gal probably due to cooler temperatures
28686	Flagship 25WG (Thiamethoxam)	IRAC 4A	False Florida Red Scale (Chrysomphalus bifasciculatus)	Holly, Chinese (Ilex cornuta) 'Cassina'	Field In-Ground	Chong	SC	2009	Drench		Excellent efficacy at 4 g per ft of shrub height; better than paraffinic oil std.
25134	Flagship 25WG (Thiamethoxam)	IRAC 4A	Scale, Oystershell (Diaspidiotus ostreiformis)	Silverbell Carolina (Halesia carolina var. carolina)	Field In-Ground	Nielsen	OH	2005	Foliar		Poor efficacy
25133	Flagship 25WG (Thiamethoxam)	IRAC 4A	Scale, Oystershell (Diaspidiotus ostreiformis)	Lilac, Common (Syringa vulgaris) 'Sensation'	Field In-Ground	Nielsen	OH	2005	Foliar		Poor control at 2 and 4 oz per 100 gal
25314	Flagship 25WG (Thiamethoxam)	IRAC 4A	Scale, Elongate Hemlock (Fiorinia externa)	Fir, Fraser (Abies fraseri)	Field In-Ground	Cowles	CT	2005	Foliar		Excellent efficacy - both elongate hemlock scale and cryptomeria scale included in population
30227	Flagship 25WG (Thiamethoxam)	IRAC 4A	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Field Container	Frank	NC	2011	Drench		Significantly reduced adults and immatures with 0.5 g per plant applied once; comparable to horticultural oil.
30299	Flagship 25WG (Thiamethoxam)	IRAC 4A	Cottony Cushion Scale (Icerya purchasi)	Cheesewood (Pittosporum sp.) P. tobira 'Verigata'	Field In-Ground	Chong	SC	2011	Foliar		Significantly reduced immatures with 8 oz per 100 gal applied twice; comparable to the standard Orthene.
30083	Flagship 25WG (Thiamethoxam)	IRAC 4A	Camelia Scale (Lepidosaphes camelliae)	Camellia (Camellia japonica)	Commercial Landscape	Chong	SC	2010	Drench		Did not significantly reduce camellia scale population at 1 and 4 g per ft height; comparable to all other treatments including the standard Orthene; no injury observed.
25152	Flagship 25WG (Thiamethoxam)	IRAC 4A	Winged Euonymus Scale	Burning Bush (Euonymus alatus)	Field Container	Freiberger	NJ	2004	Foliar		Some reduction in scale counts at 4 and 8 oz per 100 gal rates

			(<i>Lepidosaphes yanagicola</i>)							
25152	Flagship 25WG (Thiamethoxam)	IRAC 4A	Winged Euonymus Scale (<i>Lepidosaphes yanagicola</i>)	Burning Bush (<i>Euonymus alatus</i>)	Field Container	Freiberger	NJ	2005	Foliar	Efficacy comparable or better than Orthene at the 4 oz per 100 gal rate
28132	Flagship 25WG (Thiamethoxam)	IRAC 4A	Wax Myrtle Scale (<i>Melanaspis deklei</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Commercial Landscape	Chong	SC	2008	Foliar	Experiment 1: Did not significantly reduce scale population at 8 oz per 100 gal; similar to Orthene std; untreated population very low and no statistical differences were observed.
28132	Flagship 25WG (Thiamethoxam)	IRAC 4A	Wax Myrtle Scale (<i>Melanaspis deklei</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Commercial Landscape	Chong	SC	2009	Drench	Did not significantly reduce scale population at 4 g per ft shrub height; similar to Orthene std; very low non treated population so no statistical significance.
30237	Flagship 25WG (Thiamethoxam)	IRAC 4A	Gloomy Scale (<i>Melanaspis tenebricosa</i>)	Maple (<i>Acer</i> sp.) <i>A. rubrum</i>	Field In-Ground	Frank	NC	2011	Drench	Excellent control of adults and immatures with 1 g per ft ht applied once; comparable to standard paraffin oil.
25444	Flagship 25WG (Thiamethoxam)	IRAC 4A	Cottony Maple Scale (<i>Neopulvinaria innumerabilis</i>)	Maple, Silver (<i>Acer saccharinum</i>)	Field In-Ground	Davis	MI	2005	Foliar	Mediocre to good efficacy
25132	Flagship 25WG (Thiamethoxam)	IRAC 4A	Fletcher Scale (<i>Parthenolecanium fletcheri</i>)	Hybrid Yew (<i>Taxus X media</i>) <i>Densiformis</i>	Field In-Ground	Davis	MI	2004	Banded	Great efficacy with banded application.
25132	Flagship 25WG (Thiamethoxam)	IRAC 4A	Fletcher Scale (<i>Parthenolecanium fletcheri</i>)	Hybrid Yew (<i>Taxus X media</i>) <i>Densiformis</i>	Field In-Ground	Davis	MI	2004	Foliar	Good efficacy with foliar application.
29768	Flagship 25WG (Thiamethoxam)	IRAC 4A	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In-Ground	Nielsen	OH	2010	Drench	No efficacy at 4 g per inch DBH.
29768	Flagship 25WG (Thiamethoxam)	IRAC 4A	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In-Ground	Nielsen	OH	2011	Drench	Good efficacy with 4 g per ft ht; no second generation eggs were present.

25057	Flagship 25WG (Thiamethoxam)	IRAC 4A	False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	<i>Aucuba</i> (<i>Aucuba</i> sp.)	Field Container	Ludwig	TX	2004	Foliar	No impact on number of adults or nymphs, and only some reduction in percent alive at the highest tested rate (2, 4, 8 oz per 100 gal).
29629	Flagship 25WG (Thiamethoxam)	IRAC 4A	False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	<i>Magnolia</i> , Southern (<i>Magnolia grandiflora</i>)	Commercial Landscape	Chong	SC	2010	Drench	Charleston, SC: Significantly reduced false oleander scale population at 4 g per indbh; better than the standard Orthene; no injury observed.
28949	Flagship 25WG (Thiamethoxam)	IRAC 4A	White Peach Scale (<i>Pseudaulacaspis pentagona</i>)	<i>Holly</i> , Blue (<i>Ilex</i> x <i>meserveae</i>)	Field In- Ground	Kunkel	DE	2009	Drench	Mortality in untreated controls was high; no conclusions can be drawn.
29981	Flagship 25WG (Thiamethoxam)	IRAC 4A	<i>Euonymus</i> Scale (<i>Unaspis euonymi</i>)	Wintercreeper (<i>Euonymus fortunei</i>) E. vegetus 'Coloratus'	Field Container	Nielsen	OH	2008	Drench	Poor efficacy at 4 g per ft height.
28872	Flagship 25WG (Thiamethoxam)	IRAC 4A	<i>Euonymus</i> Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) 'Microphylla'	Field Container	Frank	NC	2009	Foliar	Excellent control at 8 oz per 100 gal + Dyne-amic; slower acting than Acephate
28872	Flagship 25WG (Thiamethoxam)	IRAC 4A	<i>Euonymus</i> Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>)	Field Container	Frank	NC	2010	Foliar	Excellent control with 8 oz per 100 gal + Dyne-amic; slower acting than horticultural oil.
28872	Flagship 25WG (Thiamethoxam)	IRAC 4A	<i>Euonymus</i> Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) 'Green Spire'	Field Container	Gilrein	NY	2011	Drench	Did not significantly reduce population with 0.5 g per ft ht applied once.
28872	Flagship 25WG (Thiamethoxam)	IRAC 4A	<i>Euonymus</i> Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) E. <i>fortunei</i> 'Radicans'	Field Container	Kunkel	DE	2011	Foliar	Did not significantly increase mortality with 8 oz per 100 gal + Capsil applied twice.
28872	Flagship 25WG (Thiamethoxam)	IRAC 4A	<i>Euonymus</i> Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus</i>)	Field Container	Ludwig	TX	2008	Foliar	Fair to good efficacy at 8 oz per 100 gal.

				japonicus) 'Microphylla'						
28872	Flagship 25WG (Thiamethoxam)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'SunSpot'	Field Container	Nielsen	OH	2009	Foliar	Poor control at 8 oz + 6 oz Capsil per 100 gal
28872	Flagship 25WG (Thiamethoxam)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Moonshadow'	Field Container	Potter	KY	2010	Foliar	No significant reduction of adult scales with 8 oz per 100 gal + spreader.
32153	GF-2626 1SC (Sulfoxaflor)	IRAC 4C	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Greenhouse	Frank	NC	2012	Foliar	Significantly reduced immatures with 8 and 11 fl oz per 100 gal applied twice; comparable to horticultural oil.
31283	GF-2626 1SC (Sulfoxaflor)	IRAC 4C	Cottony Cushion Scale (Icerya purchasi)	Cheesewood (Pittosporum sp.) P. tobira cv. 'variegata'	Field Container	Chong	SC	2012	Foliar	No consistent and significant reduction of scale population with 8 and 11 fl oz per 100 gal; comparable to standard paraffinic oil.
31288	GF-2626 1SC (Sulfoxaflor)	IRAC 4C	Scale, Magnolia (Neolecanium cornuparvum)	Sweet Bay (Magnolia virginiana) M. grandiflora, 'Little Gem'	Field In- Ground	Braman	GA	2012	Foliar	Excellent control of false oleander scale immatures with 8 and 11 fl oz per 100 gal; comparable to Orthene.
31353	GF-2626 1SC (Sulfoxaflor)	IRAC 4C	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Jones	OH	2012	Foliar	Mediocre control with 8 and 11 fl oz per 100 gal applied twice.
32149	Horticultural Oil (Mineral oil)	FRAC NC	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Greenhouse	Frank	NC	2012	Foliar	Significantly reduced immatures with 150 fl oz per 100 gal applied once.
32859	Horticultural Oil (Mineral oil)	FRAC NC	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.)	Field In- Ground	Persad	OH	2017	Foliar	Poor control with 1-2 gal per 100 gal applied once.
32859	Horticultural Oil (Mineral oil)	FRAC NC	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. strobus	Field In- Ground	Sadof	IN	2015	Foliar	Significant efficacy on immatures and adults with labeled rate.

31227	Horticultural Oil (Mineral oil)	FRAC NC	White Peach Scale (Pseudaulacaspis pentagona)	Holly, Blue (Ilex x meserveae)	Field In-Ground	Kunkel	DE	2009	Foliar	Mortality in untreated controls was high; no conclusions can be drawn.
31229	Horticultural Oil (Mineral oil)	FRAC NC	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Braman	GA	2014	foliar	Excellent control with 2 gal per 100 gal applied twice at 14-day interval.
31229	Horticultural Oil (Mineral oil)	FRAC NC	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Radicans'	Field Container	Kunkel	DE	2011	Foliar	Significantly increased mortality with 1 % v/v solution applied twice.
29986	Horticultural Oil (Mineral oil)	FRAC NC	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Coloratus'	Field In-Ground	Nielsen	OH	2010	Foliar	Excellent efficacy on nymphs at 3 % v/v; may have short residual.
34176	ISM-555 (ISM-555, A21377X)		Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica)	Field Container	Held	AL	2020	Foliar	Excellent control with 3.84 fl oz per 100 gal + Capsil applied twice biweekly.
34176	ISM-555 (ISM-555, A21377X)		Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica) 'Natchez'	Field Container	Held	AL	2021	Foliar	Excellent efficacy on crawlers and adults 28 DAT through 90 DAT when applied at 3.84 and 5.76 fl oz per 100 gallons twice at a two week interval.
35082	ISM-555 (ISM-555, A21377X)		Scale, Hemispherical; brown shield (Saissetia coffeae)	Coontie palm (Zamia integrifolia)	Field Container	Dale	FL	2022	Foliar	Great reduction in populations 28 DAT with 3.84 and 5.76 fl oz per 100 oz; excellent efficacy for a re-establishing population at 112 DAT.
28384	Judo 2SC (Spiromesifen)	IRAC 23	Scale, Elongate Hemlock (Fiorinia externa)	Fir, Fraser (Abies fraseri)	Field In-Ground	Cowles	CT	2008	Foliar	Very little control with at 5 and 10 fl oz per acre applied either May 19 or June 3.
34214	KOC22018-8 (Botanical Oil Blend)		Scale, Cycad (Aulacaspis yasumatsui)	Sago Palm (Cycas revoluta)	Field Container	Dale	FL	2019	Foliar	No significant control of nymphs and adults with 128 fl oz per 100 gal applied 5 times weekly.

34252	KOC22018-8 (Botanical Oil Blend)		False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	<i>Aucuba</i> (<i>Aucuba</i> sp.)	Field Container	Held	AL	2019	Foliar	Poor efficacy with 16.5 fl oz per 100 gal applied 5 times weekly, but good efficacy 6 months after treatment.
33833	KOC22018-8 (Botanical Oil Blend)		Scale, Hala (<i>Thysanococcus pandani</i>)	Hala (<i>Pandanus</i> sp.)	Field Container	Cheng	HI	2019	Foliar	Mediocre efficacy with 128 fl oz per 100 gal applied once. No phytotoxicity.
30418	Kontos 240SC (Spirotetramat)	IRAC 23	Scale, Calico (<i>Eulecanium cerasorum</i>)	Locust (<i>Gleditsia</i> sp.) <i>G. triacanthos</i> var. <i>inermis</i>	Commercial Landscape	Persad	OH	2014	Foliar	Mediocre control of nymphs with 3.4 fl oz per 100 gal by 28 DAT.
29811	Kontos 240SC (Spirotetramat)	IRAC 23	Scale, Tea (<i>Fiorinia theae</i>)	<i>Camellia</i> (<i>Camellia japonica</i>) <i>C. sasanqua</i> 'Showa-no-sakae'	Field Container	Frank	NC	2010	Foliar	Excellent control with 3.4 fl oz per 100 gal.
30228	Kontos 240SC (Spirotetramat)	IRAC 23	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Sacred Bamboo (<i>Nandina domestica</i>) 'Harbour Dwarf'	Field Container	Frank	NC	2011	Foliar	Significantly reduced adults and immatures with 3.4 fl oz per 100 gal applied once; comparable to horticultural oil.
32156	Kontos 240SC (Spirotetramat)	IRAC 23	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Sacred Bamboo (<i>Nandina domestica</i>) 'Harbour Dwarf'	Greenhouse	Frank	NC	2012	Foliar	Did not significantly reduce immatures with 3.4 fl oz per 100 gal applied once.
30300	Kontos 240SC (Spirotetramat)	IRAC 23	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Cheesewood (<i>Pittosporum</i> sp.) <i>P. tobira</i> 'Verigata'	Field In-Ground	Chong	SC	2011	Foliar	Significantly reduced immatures with 3.4 oz per 100 gal applied once; comparable to the standard Orthene.
32855	Kontos 240SC (Spirotetramat)	IRAC 23	Camelia Scale (<i>Lepidosaphes camelliae</i>)	<i>Camellia</i> (<i>Camellia japonica</i>) <i>C. japonica</i> and <i>C. sasanqua</i>	Commercial Landscape	Chong	SC	2014	Foliar	Consistent and high efficacy with 3.4 fl oz per 100 gal applied twice biweekly; comparable to the standard paraffin oil.
25149	Kontos 240SC (Spirotetramat)	IRAC 23	Winged Euonymus Scale (<i>Lepidosaphes yanagicola</i>)	Burning Bush (<i>Euonymus alatus</i>)	Field Container	Freiberger	NJ	2004	Foliar	Some reduction in scale counts at 20 fl oz per 100 gal; no injury observed.

30238	Kontos 240SC (Spirotetramat)	IRAC 23	Gloomy Scale (Melanaspis tenebricosa)	Maple (Acer sp.) A. rubrum	Field In-Ground	Frank	NC	2011	Foliar	Excellent control of adults and immatures with 3.4 fl oz per 100 gal applied once; comparable to standard paraffin oil.
29769	Kontos 240SC (Spirotetramat)	IRAC 23	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In-Ground	Nielsen	OH	2010	Foliar	Excellent efficacy at 3.4 oz per 100 gal.
29769	Kontos 240SC (Spirotetramat)	IRAC 23	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In-Ground	Nielsen	OH	2011	Foliar	Good efficacy with 3.4 oz per 100 gal through 31 DAT, but second generation eggs were present albeit in lower amounts than the nontreated check.
29769	Kontos 240SC (Spirotetramat)	IRAC 23	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. strobus	Field In-Ground	Sadof	IN	2015	Drench	No significant efficacy on immatures and adults with 3.4 oz per 100 gal.
29769	Kontos 240SC (Spirotetramat)	IRAC 23	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. strobus	Field In-Ground	Sadof	IN	2015	Foliar	No significant efficacy on immatures and adults with 3.4 oz per 100 gal.
29630	Kontos 240SC (Spirotetramat)	IRAC 23	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora)	Commercial Landscape	Chong	SC	2010	Foliar	Charleston, SC: Did not significantly reduce false oleander scale population at 3.4 fl oz per 100 gal; comparable to the standard Orthene; no injury observed.
29150	Kontos 240SC (Spirotetramat)	IRAC 23	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Green Spire'	Field Container	Gilrein	NY	2011	Foliar	Good control with 3.4 fl oz per 100 gal applied once.
26829	Kontos 240SC (Spirotetramat)	IRAC 23	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Coloratus'	Field In-Ground	Nielsen	OH	2008	Foliar	Some efficacy on nymphs at 3.4 fl oz per 100 gal; may have short residual.
29150	Kontos 240SC (Spirotetramat)	IRAC 23	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E.	Field Container	Potter	KY	2010	Foliar	No significant reduction of adult scales with 3.4 oz per 100 gal.

				fortunei 'Moonshadow'						
32164	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos var. inermis	Commercial Landscape	Persad	OH	2014	Drench	Excellent control of nymphs with 0.25 fl oz per inch DBH by 28 DAT.
32355	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica) 'In the Pink'	Field In- Ground	Arthurs (UF)	FL	2014	Drench	Good control with 12 fl oz per 100 gal applied once and 8 fl oz applied twice; inferior to SuffOil X.
32355	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field In- Ground	Braman	GA	2015	Drench	Very good control with 0.125 fl oz per ft height applied twice and 0.25 fl oz per ft height applied once.
32872	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field Container	Chen	LA	2015	Foliar	Excellent control with 8 fl oz per 100 gal; comparable to standards Ultra-Pure Oil and Distance.
32406	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Scale, Tea (Fiorinia theae)	Sasanqua camellia (Camellia sasanqua) 'Mountain Snow'	Field Container	Chen	LA	2014	Drench	Significantly reduced infestation with 8 fl oz per 100 gal applied twice and 12 fl oz applied twice; comparable to standard SuffOil-X.
32847	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.) 'Nellie Stevens'	Field Container	Chong	SC	2015	Drench	Mediocre efficacy with 8 fl oz per 100 gal applied twice every 28 days; inferior to Distance.
32847	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.)	Field Container	Frank	NC	2015	Drench	Did not significantly reduce number of adults and nymphs with 8 and 12 fl oz per 100 gal applied once.
32853	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Camelia Scale (Lepidosaphes camelliae)	Camellia (Camellia japonica) C. japonica and C. sasanqua	Commercial Landscape	Chong	SC	2014	Drench	Poor efficacy with 0.125 oz per ft height applied twice ever 4 weeks and 0.25 fl oz applied once.
32529	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Gloomy Scale (Melanaspis tenebricosa)	Maple (Acer sp.) A. rubrum	Field In- Ground	Frank	NC	2014	Drench	Data inconclusive because there were no significant differences between treatments, including untreated check.

32529	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Gloomy Scale (<i>Melanaspis tenebricosa</i>)	Maple (<i>Acer</i> sp.) <i>A. rubrum</i>	Field In- Ground	Frank	NC	2014	Foliar	Data inconclusive because there were no significant differences between treatments, including untreated check.
32223	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In- Ground	Persad	OH	2015	Drench	Significant control of nymphs with 0.125 fl oz per 100 gal applied twice bimonthly or 0.25 fl oz applied once; better than horticultural oil applied foliar.
32223	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. strobus</i>	Field In- Ground	Sadof	IN	2015	Drench	No significant efficacy on immatures and adults with 0.125 and 0.25 oz per ft ht.
32400	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	Magnolia, Southern (<i>Magnolia grandiflora</i>) 'Little Gem'	Field Container	Chen	LA	2014	Drench	Excellent control with 8 fl oz per 100 gal applied twice and 12 fl oz applied twice; comparable to standard SuffOil-X.
35481	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Scale, Hemispherical; brown shield (<i>Saissetia coffeae</i>)	Coontie palm (<i>Zamia integrifolia</i>)	Field Container	Dale	FL	2022	Foliar	Some reduction in populations 14 and 28 DAT with 8 fl oz per 100 oz; excellent efficacy for a re-establishing population at 112 DAT.
32342	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Euonymus Scale (<i>Unaspis euonymi</i>)	Wintercreeper (<i>Euonymus fortunei</i>)	Field Container	Potter	KY	2015	Drench	Scale failed to establish; no usable data were able to be collected
32158	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>)	Field Container	Braman	GA	2014	Drench	Excellent control with 12 fl oz per 100 gal applied once, and with 8 fl oz per 100 gal applied twice at 28-day interval.
32158	Mainspring GNL 200SC (Cyantraniliprole)	IRAC 28	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) <i>E. fortunei</i> 'Emerald N Gold'	Field Container	Potter	KY	2014	Drench	Significantly reduced scales (36%) with 12 fl oz per 100 gal applied at 30 days before scale hatching; inferior to Orthene.
29590	Marathon II (Imidacloprid)	IRAC 4A	Florida Wax Scale (<i>Ceroplastes floridensis</i>)	Holly (<i>Ilex</i> sp.) <i>I. cornuta</i> 'Needlepoint'	Commercial Landscape	Held (MSU)	MS	2009	Drench	Excellent control with Merit 2F at 6 ml per ft

										height applied for first or second generation
25448	Marathon II (Imidacloprid)	IRAC 4A	Cottony Maple Scale (Neopulvinaria innumerabilis)	Maple, Silver (Acer saccharinum)	Field In-Ground	Davis	MI	2005	Foliar	Poor efficacy
34520	Marathon II (Imidacloprid)	IRAC 4A	Lobate Lac Scale (Paratachardina pseudolobata)	Rosemallow (Hibiscus sp.) H. rosa-sinensis 'Dainty White'	Field Container	Cheng	HI	2018	Foliar	Excellent efficacy with 1.5 fl oz per 100 gal and no phytotoxicity.
34177	MBI 203 SC2 (MBI 203)		Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica)	Field Container	Held	AL	2020	Foliar	No control with 128 fl oz per 100 gal applied twice weekly.
34177	MBI 203 SC2 (MBI 203)		Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica) 'Natchez'	Field Container	Held	AL	2021	Foliar	Great efficacy at 14 DAT when applied at 128 fl oz per 100 gal twice at one week interval. Performance may be improved with additional applications.
35083	MBI 203 SC2 (MBI 203)		Scale, Hemispherical; brown shield (Saissetia coffeae)	Coontie palm (Zamia integrifolia)	Field Container	Dale	FL	2022	Foliar	Virtually no reduction in populations 14 and 28 DAT with 128 fl oz per 100 oz; excellent efficacy for a re-establishing population at 112 DAT.
28133	Merit 2F (Imidacloprid)	IRAC 4A	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2008	Drench	Experiment 1: Did not significantly reduce scale population at 0.2 fl oz per indbh; similar to Orthene std; untreated population very low and no statistical differences were observed.
31478	Merit 75WP (Imidacloprid)	IRAC 4A	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos inermis	Commercial Landscape	Sadof	IN	2011	Drench	Poor efficacy with Xytect 75WSP at 1.38 g ai per inch dbh.
31478	Merit 75WP (Imidacloprid)	IRAC 4A	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos inermis	Commercial Landscape	Sadof	IN	2011	Trunk spray	Poor efficacy with Xytect 75WSP at 1.7 g ai per inch dbh.
28880	MOI 201 (MOI 201)	FRAC NC	Scale, Oystershell (Diaspidiotus ostreiformis)	Silverbell Carolina (Halesia	Field In-Ground	Nielsen	OH	2008	Foliar	Very low infestation; no control at 1:500 and 1:800 conc.

				carolina var. carolina)						
28385	Onyx (Bifenthrin)	IRAC 3A	Scale, Elongate Hemlock (<i>Fiorinia externa</i>)	Fir, Fraser (<i>Abies fraseri</i>)	Field In-Ground	Cowles	CT	2008	Foliar	Some control with 6.4 fl oz per acre.
29553	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Scale, Holly Pit (<i>Asterolecanium puteanum</i>)	Holly (<i>Ilex</i> sp.) 'East Palatka'	Field In-Ground	Buss	FL	2009	Foliar	Significantly reduced number of immatures at 8 oz per 100 gal. 0% control with HendersonsTilton 6 WAT.
25730	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Florida Wax Scale (<i>Ceroplastes floridensis</i>)	Holly (<i>Ilex</i> sp.) 'China Doll'	Field Container	Ludwig	TX	2005	Foliar	No efficacy on nymphs, poor on adults at 8 oz per 100 gal.
25730	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Florida Wax Scale (<i>Ceroplastes floridensis</i>)	Holly (<i>Ilex</i> sp.) <i>I. cornuta</i> 'bufordii nana'	Field Container	Ludwig	TX	2005	Foliar	No efficacy on nymphs and adults at 8 oz per 100 gal.
25778	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Florida Red Scale (<i>Chrysomphalus aonidum</i>)	Holly, Chinese (<i>Ilex cornuta</i>) 'Dwarf Buford'	Field Container	Ludwig	TX	2005	Foliar	No significant control of nymphs and on adults at 10.5 oz per 100 gal probably due to cooler temperatures
25486	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Scale, Oystershell (<i>Diaspidiotus ostreiformis</i>)	Silverbell Carolina (<i>Halesia carolina</i> var. <i>carolina</i>) Carolina silverbell	Field In-Ground	Nielsen	OH	2005	Foliar	Poor efficacy at 8 oz per 100 gal.
25485	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Scale, Oystershell (<i>Diaspidiotus ostreiformis</i>)	Lilac, Common (<i>Syringa vulgaris</i>) 'Sensation'	Field In-Ground	Nielsen	OH	2005	Foliar	Poor control at 8 oz per 100 gal
31662	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Cheesewood (<i>Pittosporum</i> sp.) <i>P. tobira</i> 'Verigata'	Field In-Ground	Chong	SC	2011	Foliar	Significantly reduced immatures with 8 oz per 100 gal applied once.
25732	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Ternstroemia (<i>Ternstroemia</i> sp.) <i>T. gymnanthera</i>	Field Container	Ludwig	TX	2005	Foliar	Good efficacy at 8 oz per 100 gal.
30084	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Camelia Scale (<i>Lepidosaphes camelliae</i>)	Camellia (<i>Camellia japonica</i>)	Commercial Landscape	Chong	SC	2010	Foliar	No significant increase in mortality at 8 oz per 100 gal; no injury observed.

25439	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Winged Euonymus Scale (Lepidosaphes yanagicola)	Burning Bush (Euonymus alatus)	Field Container	Freiberger	NJ	2005	Foliar	Good control at 8 oz per 100 gal.
28134	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2008	Foliar	Experiment 1: Did not significantly reduce scale population at 8 fl oz per 100 gal; untreated population very low and no statistical differences were observed.
29265	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Field In-Ground	Chong	SC	2009	Foliar	Did not significantly reduce scale population at 8 oz per 100 gal + Capsil; similar to paraffinic oil std; very low non treated population so no statistical significance.
29636	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora)	Commercial Landscape	Chong	SC	2010	Foliar	Charleston, SC: Did not significantly reduce false oleander scale population at 8 oz per 100 gal; no injury observed.
32159	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Braman	GA	2014	foliar	Good to excellent control with 8 oz per 100 gal applied twice at 14-day interval.
32159	Orthene TTO 97 (Valent) (Acephate)	IRAC 1B	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Emerald N Gold'	Field Container	Potter	KY	2014	Foliar	Significantly reduced scales (74%) with 1.5 fl oz per 100 gal applied at crawler stage and 1 week later.
32856	Paraffin Oil (Mineral oil)	FRAC NC	Camelia Scale (Lepidosaphes camelliae)	Camellia (Camellia japonica) C. japonica and C. sasanqua	Commercial Landscape	Chong	SC	2014	Foliar	Consistent and high efficacy with 2 gal per 100 gal applied twice biweekly.
32852	Paraffin Oil (Mineral oil)	FRAC NC	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2013	Foliar	Significantly reduced scale population with 2 gal per 100 gal applied twice biweekly.

32851	Paraffin Oil (Mineral oil)	FRAC NC	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora)	Commercial Landscape	Chong	SC	2014	Foliar	Good control with 2 gal per 100 gal applied twice biweekly.
34212	Pradia (Cyclaniliprole + Flonicamid)	IRAC 28 + IRAC 29	Scale, Cycad (Aulacaspis yasumatsui)	Sago Palm (Cycas revoluta)	Field Container	Dale	FL	2019	Foliar	No significant control of nymphs and adults with 16.5 fl oz per 100 gal applied 3 times biweekly.
33578	Pradia (Cyclaniliprole + Flonicamid)	IRAC 28 + IRAC 29	Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica) 'Natchez'	Field Container	Vafaie	TX	2018	Foliar	Data had too much variation to provide reliable results.
33547	Pradia (Cyclaniliprole + Flonicamid)	IRAC 28 + IRAC 29	Lobate Lac Scale (Paratachardina pseudolobata)	Rosemallow (Hibiscus sp.) H. rosa-sinensis 'Dainty White'	Field Container	Cheng	HI	2018	Foliar	Efficacy with 12 and 16.5 fl oz per 100 gal slightly inferior to imidacloprid. No phytotoxicity.
33854	Pradia (Cyclaniliprole + Flonicamid)	IRAC 28 + IRAC 29	False Oleander Scale (Pseudaulacaspis cockerelli)	Japanese Laurel (Aucuba japonica)	Field Container	Held	NY	2018	Foliar	Poor control with 12 and 16.5 fl oz per 100 gal + Capsil. Researcher commented that application timing used in this trial might have been too early to provide adequate control for this insect.
34253	Pradia (Cyclaniliprole + Flonicamid)	IRAC 28 + IRAC 29	False Oleander Scale (Pseudaulacaspis cockerelli)	Aucuba (Aucuba sp.)	Field Container	Held	AL	2019	Foliar	Poor efficacy with 16.5 fl oz per 100 gal applied 3 times biweekly through 1 month after initial treatment but excellent population reduction 6 months after treatment.
33832	Pradia (Cyclaniliprole + Flonicamid)	IRAC 28 + IRAC 29	Scale, Hala (Thysanococcus pandani)	Hala (Pandanus sp.)	Field Container	Cheng	HI	2019	Foliar	Poor efficacy with 16.5 fl oz per 100 gal applied once. No phytotoxicity.
31228	QRD 452 (Extract of Chenopodium ambrosioides)	IRAC UNE	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Radicans'	Field Container	Kunkel	DE	2011	Foliar	Significantly increased mortality with 128 oz per 100 gal applied once; comparable to horticultural oil applied twice.
34179	RTSA 721 (RTSA 721)		Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica)	Field Container	Held	AL	2020	Drench	Excellent control with 5 and 10 ml per ft shrub ht

										applied once; comparable to the standard Transtect.
34179	RTSA 721 (RTSA 721)		Crape Myrtle Bark Scale (<i>Eriococcus lagerstroemia</i>)	Crape Myrtle (<i>Lagerstroemia indica</i>) 'Natchez'	Field Container	Held	AL	2021	Drench	Excellent efficacy with 2.5 and 10 ml per ft shrub height at 7 weeks after application, but only the high rate provided sufficient efficacy at 16 weeks. No impact on plant growth.
34540	RTSA 721 (RTSA 721)		Scale, Magnolia (<i>Neolecanium cornuparvum</i>)	Magnolia, Southern (<i>Magnolia grandiflora</i>) 'Bracken's Brown Beauty'	Field In-Ground	Chong	SC	2020	Basal spray	Good efficacy with 100 ml per gal + Scrimmage surfactant; comparable to the standard Transtect. No phytotoxicity.
34540	RTSA 721 (RTSA 721)		Scale, Magnolia (<i>Neolecanium cornuparvum</i>)	Magnolia, Southern (<i>Magnolia grandiflora</i>) 'Bracken's Brown Beauty'	Field In-Ground	Chong	SC	2020	Drench	Good efficacy with 10 ml per in DBH; comparable to the standard Transtect. No phytotoxicity.
28696	Rycar (Pyrifluquinazon)	IRAC UN	Scale, Holly Pit (<i>Asterolecanium puteanum</i>)	Holly (<i>Ilex</i> sp.) 'East Palatka'	Field In-Ground	Buss	FL	2009	Foliar	Did not significantly reduce number of immatures at 18 fl oz per 100 gal. 32% control with HendersonsTilton 6 WAT.
28688	Rycar (Pyrifluquinazon)	IRAC UN	False Florida Red Scale (<i>Chrysomphalus bifasciculatus</i>)	Holly, Chinese (<i>Ilex cornuta</i>) 'Cassina'	Field In-Ground	Chong	SC	2009	Foliar	Good efficacy at 18 fl oz per 100 gal; equivalent to paraffinic oil standard.
30229	Rycar (Pyrifluquinazon)	IRAC UN	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Sacred Bamboo (<i>Nandina domestica</i>) 'Harbour Dwarf'	Field Container	Frank	NC	2011	Foliar	Significantly reduced adults and immatures with 18 fl oz per 100 gal applied once; comparable to horticultural oil.
30301	Rycar (Pyrifluquinazon)	IRAC UN	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Cheesewood (<i>Pittosporum</i> sp.) <i>P. tobira</i> 'Verigata'	Field In-Ground	Chong	SC	2011	Foliar	Significantly reduced immatures with 18 fl oz per 100 gal applied once; almost comparable to the standard Orthene, though slower-acting.

28919	Rycar (Pyrifluquinazon)	IRAC UN	Wax Myrtle Scale (<i>Melanaspis deklei</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Commercial Landscape	Chong	SC	2009	Foliar	Did not significantly reduce scale population at 18 oz per 100 gal; similar to Orthene std; very low non treated population so no statistical significance.
30239	Rycar (Pyrifluquinazon)	IRAC UN	Gloomy Scale (<i>Melanaspis tenebricosa</i>)	Maple (<i>Acer</i> sp.) <i>A. rubrum</i>	Field In-Ground	Frank	NC	2011	Foliar	Excellent control of adults and immatures with 18 fl oz per 100 gal applied once; comparable to standard paraffin oil.
29770	Rycar (Pyrifluquinazon)	IRAC UN	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In-Ground	Nielsen	OH	2010	Foliar	Excellent efficacy at 18 fl oz per 100 gal.
29770	Rycar (Pyrifluquinazon)	IRAC UN	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In-Ground	Nielsen	OH	2011	Foliar	Excellent efficacy with 18 fl oz per 100 gal.
29631	Rycar (Pyrifluquinazon)	IRAC UN	False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	Magnolia, Southern (<i>Magnolia grandiflora</i>)	Commercial Landscape	Chong	SC	2010	Foliar	Litchfield, SC: Significantly reduced false oleander scale population at 18 fl oz per 100 gal; much inferior to the standard Paraffinic oil; no injury observed.
28951	Rycar (Pyrifluquinazon)	IRAC UN	White Peach Scale (<i>Pseudaulacaspis pentagona</i>)	Holly, Blue (<i>Ilex x meserveae</i>)	Field In-Ground	Kunkel	DE	2009	Foliar	Mortality in untreated controls was high; no conclusions can be drawn.
28873	Rycar (Pyrifluquinazon)	IRAC UN	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) 'Microphylla'	Field Container	Frank	NC	2009	Foliar	Excellent control at 18 fl oz per 100 gal; slower acting than Acephate
28873	Rycar (Pyrifluquinazon)	IRAC UN	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>)	Field Container	Frank	NC	2010	Foliar	Excellent control with 18 fl oz per 100 gal; slower acting than horticultural oil.
28873	Rycar (Pyrifluquinazon)	IRAC UN	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) 'Green Spire'	Field Container	Gilrein	NY	2011	Foliar	Did not significantly reduce population with 18 fl oz per 100 gal applied once.
28873	Rycar (Pyrifluquinazon)	IRAC UN	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus</i>)	Field Container	Kunkel	DE	2011	Foliar	Did not significantly increase mortality with 18

				japonicus) E. fortunei 'Radicans'						fl oz per 100 gal applied once.
29982	Rycar (Pyrifluquinazon)	IRAC UN	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Coloratus'	Field In-Ground	Nielsen	OH	2008	Foliar	Poor efficacy at 18 fl oz per 100 gal.
28873	Rycar (Pyrifluquinazon)	IRAC UN	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Sunspot'	Field Container	Nielsen	OH	2009	Foliar	Poor control at 18 fl oz per 100 gal
28873	Rycar (Pyrifluquinazon)	IRAC UN	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Moonshadow'	Field Container	Potter	KY	2010	Foliar	Significantly reduced 1st generation adult scales with 18 fl oz per 100 gal; better than horticultural oil; no impact on 2nd generation.
28697	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Holly Pit (Asterolecanium puteanum)	Holly (Ilex sp.) 'East Palatka'	Field In-Ground	Buss	FL	2009	Sprenc	Significantly reduced number of immatures at 6 g per ft height; comparable to Orthene. 16% control with HendersonsTilton 6 WAT.
28972	Safari 20SG (Dinotefuran)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) I. cornuta 'Needlepoint'	Commercial Landscape	Held (MSU)	TN	2009	Drench	Excellent control at 6 g per ft height applied for first generation, less effective when applied for 2nd generation.
25050	Safari 20SG (Dinotefuran)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) 'Dwarf Buford'	Field Container	Ludwig	TX	2004	Drench	Great to excellent efficacy at 12, 24, and 48 oz per 100 gal at 45DAT.
25774	Safari 20SG (Dinotefuran)	IRAC 4A	Florida Red Scale (Chrysomphalus aonidum)	Holly, Chinese (Ilex cornuta) 'Dwarf Buford'	Field Container	Ludwig	TX	2005	Drench	No significant control of nymphs and on adults at 12 and 24 oz per 100 gal probably due to cooler temperatures
25774	Safari 20SG (Dinotefuran)	IRAC 4A	Florida Red Scale (Chrysomphalus aonidum)	Holly, Chinese (Ilex cornuta) 'Dwarf Buford'	Field Container	Ludwig	TX	2005	Foliar	No significant control of nymphs and on adults at 4 and 8 oz per 100 gal

										probably due to cooler temperatures
28689	Safari 20SG (Dinotefuran)	IRAC 4A	False Florida Red Scale (Chrysomphalus bifasciculatus)	Holly, Chinese (Ilex cornuta) 'Cassina'	Field In-Ground	Chong	SC	2009	Drench	Excellent efficacy at 6 g per ft of shrub height; better than paraffinic oil std
25141	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Oystershell (Diaspidiotus ostreiformis)	Silverbell Carolina (Halesia carolina var. carolina)	Field In-Ground	Nielsen	OH	2005	Drench	Excellent efficacy with drench application
25141	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Oystershell (Diaspidiotus ostreiformis)	Silverbell Carolina (Halesia carolina var. carolina) Carolina silverbell	Field In-Ground	Nielsen	OH	2005	Foliar	Poor efficacy with foliar application
25141	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Oystershell (Diaspidiotus ostreiformis)	Silverbell Carolina (Halesia carolina var. carolina)	Field In-Ground	Nielsen	OH	2008	Drench	Very low infestation; poor control at 6, acceptable at 12 g per ft ht
25140	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Oystershell (Diaspidiotus ostreiformis)	Lilac, Common (Syringa vulgaris) 'Sensation'	Field In-Ground	Nielsen	OH	2005	Drench	Excellent efficacy with foliar application
25140	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Oystershell (Diaspidiotus ostreiformis)	Lilac, Common (Syringa vulgaris) 'Sensation'	Field In-Ground	Nielsen	OH	2005	Foliar	Poor efficacy with foliar application
33873	Safari 20SG (Dinotefuran)	IRAC 4A	Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica) 'Natchez'	Field Container	Vafaie	TX	2018	Foliar	Data had too much variation to provide reliable results. Researcher's preliminary conclusions demonstrate reliable scale suppression with Safari at 8 oz per 100 gal, comparable to the standard Distance.
29845	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos var. inermis	Commercial Landscape	Persad	OH	2014	Drench	100 % control of nymphs with 6 g per inch DBH by 28 DAT.

29845	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos inermis	Commercial Landscape	Sadof	IN	2011	Drench	Poor efficacy with Transtect 70WSP at 1.45 g ai per inch DBH.
29845	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos inermis	Commercial Landscape	Sadof	IN	2011	Trunk spray	Poor efficacy with Transtect 70WSP at 1.7 g ai per in dbh.
26720	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Calico (Eulecanium cerasorum)	Japanese Zelkova (Zelkova serrata)	Commercial Landscape	Potter	KY	2007	Soil Injection	Good to great control using 8.5 g product per inch dbh.
26720	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Calico (Eulecanium cerasorum)	Japanese Zelkova (Zelkova serrata)	Commercial Landscape	Potter	KY	2007	Trunk spray	Excellent control using 13 oz + 3.1 ox Pentrabark per 1.1 gal.
25315	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Elongate Hemlock (Fiorinia externa)	Fir, Fraser (Abies fraseri)	Field In- Ground	Cowles	CT	2005	Drench	Excellent efficacy - 100% control
25315	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Elongate Hemlock (Fiorinia externa)	Fir, Fraser (Abies fraseri)	Field In- Ground	Cowles	CT	2005	Foliar	Excellent efficacy >90% control
25315	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Elongate Hemlock (Fiorinia externa)	Fir, Fraser (Abies fraseri)	Field In- Ground	Cowles	CT	2008	Drench	No to some efficacy at 0.68, 1.35, and 2.70 lb product per acre with soil applications.
25315	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Elongate Hemlock (Fiorinia externa)	Fir, Fraser (Abies fraseri)	Field In- Ground	Cowles	CT	2008	Trunk spray	Good efficacy at 0.68, 1.35, and 2.70 lb product per acre with truck applications.
29858	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica) 'In the Pink'	Field Container	Arthurs (UF)	FL	2014	Drench	Excellent control with 24 oz per 100 gal applied once; comparable to SuffOil X.
29858	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica) C. sasanqua 'Showa-no- sakae'	Field Container	Frank	NC	2010	Drench	Excellent control with 24 oz per 100 gal.
29585	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field In- Ground	Ludwig	TX	2008	Drench	Good efficacy at 24 fl oz per 100 gal; high mortality in untreated Check.

29362	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Tea (<i>Fiorinia theae</i>)	Holly (<i>Ilex</i> sp.) 'Burfordii Nana'	Field In- Ground	Hesselein	AL	2009	Drench	Significantly increased % scale mortality at 6 g per ft plant height; equal to petroleum oil spray
30230	Safari 20SG (Dinotefuran)	IRAC 4A	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Sacred Bamboo (<i>Nandina domestica</i>) 'Harbour Dwarf'	Field Container	Frank	NC	2011	Drench	Significantly reduced adults and immatures with 24 oz per 100 gal applied once; comparable to horticultural oil.
30302	Safari 20SG (Dinotefuran)	IRAC 4A	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Cheesewood (<i>Pittosporum sp.</i>) <i>P. tobira</i> 'Verigata'	Field In- Ground	Chong	SC	2011	Drench	Significantly reduced immatures with 6 g per ft ht applied once; best product, better than the standard Orthene.
25060	Safari 20SG (Dinotefuran)	IRAC 4A	Cottony Cushion Scale (<i>Icerya purchasi</i>)	<i>Ternstroemia</i> (<i>Ternstroemia sp.</i>) <i>T. gymnanthera</i>	Field Container	Ludwig	TX	2005	Drench	Poor efficacy
25060	Safari 20SG (Dinotefuran)	IRAC 4A	Cottony Cushion Scale (<i>Icerya purchasi</i>)	<i>Ternstroemia</i> (<i>Ternstroemia sp.</i>) <i>T. gymnanthera</i>	Field Container	Ludwig	TX	2005	Foliar	Poor efficacy
30086	Safari 20SG (Dinotefuran)	IRAC 4A	Camelia Scale (<i>Lepidosaphes camelliae</i>)	<i>Camellia</i> (<i>Camellia japonica</i>)	Commercial Landscape	Chong	SC	2010	Drench	Did not significantly reduce camellia scale population at 6 g per ft height; comparable to all other treatments including the standard Orthene; no injury observed.
25153	Safari 20SG (Dinotefuran)	IRAC 4A	Winged <i>Euonymus</i> Scale (<i>Lepidosaphes yanagicola</i>)	Burning Bush (<i>Euonymus alatus</i>)	Field Container	Freiberger	NJ	2004	Foliar	Poor efficacy
25153	Safari 20SG (Dinotefuran)	IRAC 4A	Winged <i>Euonymus</i> Scale (<i>Lepidosaphes yanagicola</i>)	Burning Bush (<i>Euonymus alatus</i>)	Field Container	Freiberger	NJ	2005	Drench	Little to no control
25153	Safari 20SG (Dinotefuran)	IRAC 4A	Winged <i>Euonymus</i> Scale (<i>Lepidosaphes yanagicola</i>)	Burning Bush (<i>Euonymus alatus</i>)	Field Container	Freiberger	NJ	2005	Foliar	Little to no control
28129	Safari 20SG (Dinotefuran)	IRAC 4A	Wax Myrtle Scale (<i>Melanaspis deklei</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Commercial Landscape	Chong	SC	2008	Drench	Experiment 1 (Early and Late Drenches): Did not significantly reduce scale

										population at 12 g per indbh; similar to Orthene std; untreated population very low and no statistical differences were observed.
28129	Safari 20SG (Dinotefuran)	IRAC 4A	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2008	Foliar	Experiment 2: Reduced scale population but not statistically significantly at 8 oz per 100 gal; similar to Sunspray Ultrafine std
28129	Safari 20SG (Dinotefuran)	IRAC 4A	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2009	Drench	Did not significantly reduce scale population at 6 g per ft shrub height; similar to Orthene std; very low non treated population so no statistical significance.
28129	Safari 20SG (Dinotefuran)	IRAC 4A	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2009	Foliar	Experiment 2: Significantly reduced scale population at 6 g per ft shrub height; similar to Orthene std; very low non treated population so no statistical significance.
30240	Safari 20SG (Dinotefuran)	IRAC 4A	Gloomy Scale (Melanaspis tenebricosa)	Maple (Acer sp.) A. rubrum	Field In-Ground	Frank	NC	2011	Trunk spray	Excellent control of adults and immatures with 12 oz per 100 gal applied once; comparable to standard paraffin oil.
25445	Safari 20SG (Dinotefuran)	IRAC 4A	Cottony Maple Scale (Neopulvinaria innumerabilis)	Maple, Silver (Acer saccharinum)	Field In-Ground	Davis	MI	2005	Drench	Poor efficacy
25445	Safari 20SG (Dinotefuran)	IRAC 4A	Cottony Maple Scale (Neopulvinaria innumerabilis)	Maple, Silver (Acer saccharinum)	Field In-Ground	Davis	MI	2005	Foliar	Poor to mediocre efficacy
25139	Safari 20SG (Dinotefuran)	IRAC 4A	Fletcher Scale (Parthenolecanium fletcheri)	Hybrid Yew (Taxus X media) 'Densiformis'	Field In-Ground	Davis	MI	2004	Banded	Mediocre to good efficacy increasing with rate.
25139	Safari 20SG (Dinotefuran)	IRAC 4A	Fletcher Scale (Parthenolecanium fletcheri)	Hybrid Yew (Taxus X	Field In-Ground	Davis	MI	2004	Foliar	Mediocre control.

				media) Densiformis						
29771	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Jones	OH	2012	Soil injection	Mediocre control with 6 g per ft height applied once.
29771	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Nielsen	OH	2010	Drench	Excellent efficacy at 6 g per inch DBH.
29771	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Nielsen	OH	2011	Drench	Excellent efficacy with 6 g per inch DBH.
29771	Safari 20SG (Dinotefuran)	IRAC 4A	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. strobus	Field In- Ground	Sadof	IN	2015	Foliar	No significant efficacy on immatures and adults with 18 oz per 100 gal.
25055	Safari 20SG (Dinotefuran)	IRAC 4A	False Oleander Scale (Pseudaulacaspis cockerelli)	Aucuba (Aucuba sp.)	Field Container	Ludwig	TX	2004	Drench	No impact on number of adults or nymphs, but some reduction in percent alive with 12, 24, and 48 oz per 100 gal.
29632	Safari 20SG (Dinotefuran)	IRAC 4A	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora)	Commercial Landscape	Chong	SC	2010	Drench	Charleston, SC: Significantly reduced false oleander scale population at 6 g per indbh; best treatment; no injury observed.
28952	Safari 20SG (Dinotefuran)	IRAC 4A	White Peach Scale (Pseudaulacaspis pentagona)	Holly, Blue (Ilex x meserveae)	Field In- Ground	Kunkel	DE	2009	Drench	Mortality in untreated controls was high; no conclusions can be drawn.
28874	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Braman	GA	2014	Drench	Excellent control with 24 oz per 100 gal applied once.
28874	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Microphylla'	Field Container	Frank	NC	2009	Drench	Excellent control at 24 oz per 100 gal; slower acting than Acephate
28874	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Frank	NC	2010	Drench	Excellent control with 24 oz per 100 gal; slower acting than horticultural oil.
28874	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus)	Field Container	Gilrein	NY	2011	Drench	Did not significantly reduce population with 24

				japonicus) 'Green Spire'						oz per 100 gal applied once.
28874	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Radicans'	Field Container	Kunkel	DE	2011	Drench	Significantly increased mortality with 24 oz per 100 gal applied once; slightly better than horticultural oil applied twice.
28874	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Microphylla'	Field Container	Ludwig	TX	2008	Foliar	Fair to good efficacy at 24 fl oz per 100 gal.
26683	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) Euonymus vegetus 'Fortunei'	Field In- Ground	Nielsen	OH	2007	Bark spray	Excellent control of 1st, good control of 2nd generation nymphs with bark spray at 24 oz per 100 gal.
26683	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) Euonymus vegetus 'Fortunei'	Field In- Ground	Nielsen	OH	2007	Drench	Excellent control of 1st, good control of 2nd generation nymphs with soil drench at 6 g per ft height poor on 1st, fair on second generation.
26683	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Coloratus'	Field In- Ground	Nielsen	OH	2008	Drench	Good efficacy at 6 g per ft height.
28874	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Sunspot'	Field Container	Nielsen	OH	2009	Drench	Excellent control at 6 g per ft height.
28874	Safari 20SG (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E.	Field Container	Potter	KY	2010	Drench	Significantly reduced 1st generation adult scales with 24 oz per 100 gal; better than horticultural oil.

				fortunei 'Moonshadow'						
28878	Safari 2G (Dinotefuran)	IRAC 4A	Scale, Holly Pit (Asterolecanium puteantum)	Holly (Ilex sp.) 'East Palatka'	Field In- Ground	Buss	FL	2009	Broadcast	Did not significantly reduce number of immatures at 60 g per ft height. 57% control with HendersonsTilton 6 WAT.
29846	Safari 2G (Dinotefuran)	IRAC 4A	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos inermis	Commercial Landscape	Sadof	IN	2011	Broadcast	Mediocre efficacy with 3 g ai per inch DBH.
29859	Safari 2G (Dinotefuran)	IRAC 4A	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica) C. sasanqua 'Showa-no- sakae'	Field Container	Frank	NC	2010	Broadcast	Excellent control with 2.6 g per gal potting media.
29586	Safari 2G (Dinotefuran)	IRAC 4A	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field In- Ground	Ludwig	TX	2008	Soil Incorporation	No significant efficacy at 2.6 g per gal of media; high mortality in untreated Check.
29363	Safari 2G (Dinotefuran)	IRAC 4A	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.) 'Bufordii Nana'	Field In- Ground	Hesselein	AL	2009	Top Dress	Significantly increased % scale mortality at 60 g per ft plant height; equal to petroleum oil
30231	Safari 2G (Dinotefuran)	IRAC 4A	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Field Container	Frank	NC	2011	Broadcast	Significantly reduced adults and immatures with 2.6 g per plant applied once; comparable to horticultural oil.
30303	Safari 2G (Dinotefuran)	IRAC 4A	Cottony Cushion Scale (Icerya purchasi)	Cheesewood (Pittosporum sp.) P. tobira 'Verigata'	Field In- Ground	Chong	SC	2011	Broadcast	Significantly reduced immatures with 60 g per ft ht applied once; best product, better than the standard Orthene.
30087	Safari 2G (Dinotefuran)	IRAC 4A	Camelia Scale (Lepidosaphes camelliae)	Camellia (Camellia japonica)	Commercial Landscape	Chong	SC	2010	Broadcast	Did not significantly reduce camellia scale population at 60 g per ft height; comparable to all other treatments including the standard Orthene; no injury observed.

28917	Safari 2G (Dinotefuran)	IRAC 4A	Wax Myrtle Scale (<i>Melanaspis deklei</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Commercial Landscape	Chong	SC	2009	Broadcast	Did not significantly reduce scale population at 60 g per ft shrub height; similar to Orthene std; very low non treated population so no statistical significance.
30241	Safari 2G (Dinotefuran)	IRAC 4A	Gloomy Scale (<i>Melanaspis tenebricosa</i>)	Maple (<i>Acer</i> sp.) <i>A. rubrum</i>	Field In-Ground	Frank	NC	2011	Drench	Excellent control of adults and immatures with 6 g per inch dbh applied once; comparable to standard paraffin oil.
29772	Safari 2G (Dinotefuran)	IRAC 4A	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In-Ground	Nielsen	OH	2010	Broadcast	Poor efficacy at 60 g per inch DBH
29772	Safari 2G (Dinotefuran)	IRAC 4A	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In-Ground	Nielsen	OH	2011	Broadcast	Poor efficacy through 21 DAT with 60 g per inch DBH; however no second generation eggs were present.
29633	Safari 2G (Dinotefuran)	IRAC 4A	False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	Magnolia, Southern (<i>Magnolia grandiflora</i>)	Commercial Landscape	Chong	SC	2010	Broadcast	Charleston, SC: Significantly reduced false oleander scale population at 60 g per indbh; better than the standard Orthene; no injury observed.
28953	Safari 2G (Dinotefuran)	IRAC 4A	White Peach Scale (<i>Pseudaulacaspis pentagona</i>)	Holly, Blue (<i>Ilex x meserveae</i>)	Field In-Ground	Kunkel	DE	2009	Broadcast	Mortality in untreated controls was high; no conclusions can be drawn.
28875	Safari 2G (Dinotefuran)	IRAC 4A	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) ' <i>Microphylla</i> '	Field Container	Frank	NC	2009	Broadcast	Good control but slow acting at 7.8 g per 3 gal container; inferior to Acephate
28875	Safari 2G (Dinotefuran)	IRAC 4A	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>)	Field Container	Frank	NC	2010	Broadcast	Excellent control with 7.8 g ai per 3 gal media; slower acting than horticultural oil.
28875	Safari 2G (Dinotefuran)	IRAC 4A	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) ' <i>Microphylla</i> '	Field Container	Ludwig	TX	2008	Soil incorporation	Excellent efficacy at 2.6 g per gal of media.

29985	Safari 2G (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Coloratus'	Field In- Ground	Nielsen	OH	2008	Broadcast	Good efficacy at 60 g per ft height.
28875	Safari 2G (Dinotefuran)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Sunspot'	Field Container	Nielsen	OH	2009	Top Dress	Poor control at 60 g per ft height
29371	Saf-T-Oil (Mineral oil)	FRAC NC	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.) 'Burfordii Nana'	Field Container	Hesselein	AL	2009	Foliar	Significantly increased % scale mortality at 2 gal per 100 gal.
34213	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Scale, Cycad (Aulacaspis yasumatsui)	Sago Palm (Cycas revoluta)	Field Container	Dale	FL	2019	Foliar	No control of nymphs and adults with 28 fl oz per 100 gal applied 3 times biweekly.
33577	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica) 'Natchez'	Field Container	Vafaie	TX	2018	Foliar	Data had too much variation to provide reliable results.
32354	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field In- Ground	Braman	GA	2015	Foliar	Very good control with 22 and 28 fl oz per 100 gal applied twice biweekly.
32871	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field Container	Chen	LA	2015	Foliar	Excellent control with 22 and 28 fl oz per 100 gal; comparable to standards Ultra-Pure Oil and Distance.
32846	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.) 'Nellie Stevens'	Field Container	Chong	SC	2015	Foliar	Good efficacy with 22 and 28 fl oz per 100 gal + Capsil applied 3 times biweekly; inferior to Distance.
32846	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.)	Field Container	Frank	NC	2015	Foliar	Did not significantly reduce number of adults and nymphs with 22 and 28 fl oz per 100 gal applied twice biweekly.
33546	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Lobate Lac Scale (Paratachardina pseudolobata)	Rosemallow (Hibiscus sp.)	Field Container	Cheng	HI	2018	Foliar	Efficacy with 22 and 28 fl oz per 100 gal slightly

				H. rosa-sinensis 'Dainty White'						inferior to imidacloprid. No phytotoxicity.
32222	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Persad	OH	2015	Foliar	Mediocre control with 22 and 28 fl oz per 100 gal applied 3 times weekly.
32222	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. strobus	Field In- Ground	Sadof	IN	2015	Foliar	No significant efficacy on immatures and adults with 22 and 28 fl oz per 100 gal.
33852	Sarisa 50SL (Cyclaniliprole)	IRAC 28	False Oleander Scale (Pseudaulacaspis cockerelli)	Japanese Laurel (Aucuba japonica)	Field Container	Held	AL	2018	Foliar	Poor control with 22 and 28 fl oz per 100 gal + NIS. Researcher commented that application timing used in this trial might have been too early to provide adequate control for this insect.
34254	Sarisa 50SL (Cyclaniliprole)	IRAC 28	False Oleander Scale (Pseudaulacaspis cockerelli)	Aucuba (Aucuba sp.)	Field Container	Held	AL	2019	Foliar	Poor efficacy with 28 fl oz per 100 gal + NIS applied 3 times biweekly through 1 month after initial treatment but some population reduction 6 months after treatment
33831	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Scale, Hala (Thysanococcus pandani)	Hala (Pandanus sp.)	Field Container	Cheng	HI	2019	Foliar	Poor efficacy with 28 fl oz per 100 gal applied 3 times biweekly. No phytotoxicity.
32341	Sarisa 50SL (Cyclaniliprole)	IRAC 28	Euonymus Scale (Unaspis euonymi)	Wintercreeper (Euonymus fortunei)	Field Container	Potter	KY	2015	Foliar	Scale failed to establish; no usable data were able to be collected
34180	SP3014 (SP3014)		Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica)	Field Container	Held	AL	2020	Foliar	No control with 13 fl oz per 100 gal + Capsil applied 3 times weekly.
34180	SP3014 (SP3014)		Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica) 'Natchez'	Field Container	Held	AL	2021	Foliar	Good efficacy with 13 and 26 fl oz per 100 gal 4 weeks after application, but populations rebounded by 13 weeks.
35086	SP3014 (SP3014)		Scale, Hemispherical; brown shield (Saissetia coffeae)	Coontie palm (Zamia integrifolia)	Field Container	Dale	FL	2022	Foliar	Good reduction in populations 14 DAT with 32 fl oz per 100 oz; excellent efficacy for a re- establishing population at 112 DAT.

32035	SuffOil X (Synergy) (Mineral oil)	FRAC NC	Scale, Tea (<i>Fiorinia theae</i>)	Camellia (<i>Camellia japonica</i>) 'In the Pink'	Field Container	Arthurs (UF)	FL	2014	Foliar	Excellent control with 256 fl oz per 100 gal applied 3 times.
32408	SuffOil X (Synergy) (Mineral oil)	FRAC NC	Scale, Tea (<i>Fiorinia theae</i>)	Sasanqua camellia (<i>Camellia sasanqua</i>) 'Mountain Snow'	Field Container	Chen	LA	2014	Foliar	Significantly reduced infestation with 1 gal per 100 gal applied twice.
32530	SuffOil X (Synergy) (Mineral oil)	FRAC NC	Gloomy Scale (<i>Melanaspis tenebricosa</i>)	Maple (<i>Acer</i> sp.) <i>A. rubrum</i>	Field In-Ground	Frank	NC	2014	Foliar	Data inconclusive because there were no significant differences between treatments, including untreated check.
32403	SuffOil X (Synergy) (Mineral oil)	FRAC NC	False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	Magnolia, Southern (<i>Magnolia grandiflora</i>) 'Little Gem'	Field Container	Chen	LA	2014	Foliar	Excellent control with 1 gal per 100 gal applied twice.
28137	Sun Spray Ultra-Fine Spray Oil (Mineral oil)	FRAC NC	Wax Myrtle Scale (<i>Melanaspis deklei</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Commercial Landscape	Chong	SC	2008	Foliar	Experiment 2: Did not significantly reduce scale population at 2 % (2 gal per 100 gal).
30579	Sun Spray Ultra-Fine Spray Oil (Mineral oil)	FRAC NC	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In-Ground	Nielsen	OH	2011	Foliar	Excellent efficacy with 2 gal per 100 gal.
29291	Sun Spray Ultra-Fine Spray Oil (Mineral oil)	FRAC NC	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindletree (<i>Euonymus</i> sp.) <i>E. vegetus</i> 'Sunspot'	Field Container	Nielsen	OH	2009	Foliar	Excellent control at 3%.
31475	Talstar Flowable Insecticide/Miticide (Bifenthrin)	IRAC 3A	Scale, Calico (<i>Eulecanium cerasorum</i>)	Locust (<i>Gleditsia</i> sp.) <i>G. triacanthos inermis</i>	Commercial Landscape	Sadof	IN	2011	Foliar	Mediocre efficacy with 20 fl oz per 100 gal.
25449	Talstar Flowable Insecticide/Miticide (Bifenthrin)	IRAC 3A	Cottony Maple Scale (<i>Neopulvinaria innumerabilis</i>)	Maple, Silver (<i>Acer saccharinum</i>)	Field In-Ground	Davis	MI	2005	Foliar	No efficacy.
28698	Talus 40SC (Buprofezin)	IRAC 16	Scale, Holly Pit (<i>Asterolecanium puteanum</i>)	Holly (<i>Ilex</i> sp.) 'East Palatka'	Field In-Ground	Buss	FL	2009	Foliar	Did not significantly reduce number of immatures at 21.5 fl oz per 100 gal. 0% control with Hendersons Tilton 6 WAT.

25049	Talus 40SC (Buprofezin)	IRAC 16	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) 'Dwarf Buford'	Field Container	Ludwig	TX	2004	Foliar	Significant mortality 45 days with all rates (21.5, 43, 86 fl oz per 100 gal).
25049	Talus 40SC (Buprofezin)	IRAC 16	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) 'China Doll'	Field Container	Ludwig	TX	2005	Foliar	Minimal impact on adults; some efficacy on nymphs at 14 DAT at 21.5 fl oz per 100 gal
28690	Talus 40SC (Buprofezin)	IRAC 16	False Florida Red Scale (Chrysomphalus bifasciculatus)	Holly, Chinese (Ilex cornuta) 'Cassina'	Field In- Ground	Chong	SC	2009	Foliar	Good efficacy at 21.5 fl oz per 100 gal + Capsil; similar to paraffinic oil std
25143	Talus 40SC (Buprofezin)	IRAC 16	Scale, Oystershell (Diaspidiotus ostreiformis)	Silverbell Carolina (Halesia carolina var. carolina)	Field In- Ground	Nielsen	OH	2005	Foliar	Excellent efficacy
25144	Talus 40SC (Buprofezin)	IRAC 16	Scale, Oystershell (Diaspidiotus ostreiformis)	Lilac, Common (Syringa vulgaris) 'Sensation'	Field In- Ground	Nielsen	OH	2005	Foliar	Excellent control at 21.5 fl oz per 100 gal
25316	Talus 40SC (Buprofezin)	IRAC 16	Scale, Elongate Hemlock (Fiorinia externa)	Fir, Fraser (Abies fraseri)	Field In- Ground	Cowles	CT	2005	Foliar	Great efficacy
32038	Talus 40SC (Buprofezin)	IRAC 16	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica) 'In the Pink'	Field Container	Arthurs (UF)	FL	2014	Foliar	Very good control with 14 oz per 100 gal + Capsil applied twice; inferior to SuffOil X.
25154	Talus 40SC (Buprofezin)	IRAC 16	Winged Euonymus Scale (Lepidosaphes yanagicola)	Burning Bush (Euonymus alatus)	Field Container	Freiberger	NJ	2004	Foliar	Excellent efficacy
25154	Talus 40SC (Buprofezin)	IRAC 16	Winged Euonymus Scale (Lepidosaphes yanagicola)	Burning Bush (Euonymus alatus)	Field Container	Freiberger	NJ	2005	Foliar	Excellent efficacy comparable to Orthene
27842	Talus 40SC (Buprofezin)	IRAC 16	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2008	Foliar	Experiment 2: Did not significantly reduce scale population at 21.5 fl oz per 100 gal; similar to Sunspray Ultrafine std
27842	Talus 40SC (Buprofezin)	IRAC 16	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2009	Foliar	Experiment 2: Significantly reduced scale population at 21.5 fl oz per 100 gal; similar to

										paraffinic oil std; very low non treated population so no statistical significance.
25446	Talus 40SC (Buprofezin)	IRAC 16	Cottony Maple Scale (Neopulvinaria innumerabilis)	Maple, Silver (Acer saccharinum)	Field In-Ground	Davis	MI	2005	Foliar	Poor efficacy
25156	Talus 40SC (Buprofezin)	IRAC 16	Fletcher Scale (Parthenolecanium fletcheri)	Hybrid Yew (Taxus X media) 'Densiformis'	Field In-Ground	Davis	MI	2004	Foliar	Mediocre to good efficacy.
25156	Talus 40SC (Buprofezin)	IRAC 16	Fletcher Scale (Parthenolecanium fletcheri)	Hybrid Yew (Taxus X media) T. densiformis	Field In-Ground	Nielsen	OH	2001	Foliar	
25054	Talus 40SC (Buprofezin)	IRAC 16	False Oleander Scale (Pseudaulacaspis cockerelli)	Aucuba (Aucuba sp.)	Field Container	Ludwig	TX	2004	Foliar	No impact on number of adults or nymphs or percent alive with 21.5, 43 or 86 oz per 100 gal.
28954	Talus 40SC (Buprofezin)	IRAC 16	White Peach Scale (Pseudaulacaspis pentagona)	Holly, Blue (Ilex x meserveae)	Field In-Ground	Kunkel	DE	2009	Foliar	Mortality in untreated controls was high; no conclusions can be drawn.
35482	Talus 40SC (Buprofezin)	IRAC 16	Scale, Hemispherical; brown shield (Saissetia coffeae)	Coontie palm (Zamia integrifolia)	Field Container	Dale	FL	2022	Foliar	Good reduction in populations 28 DAT with 14 fl oz per 100 oz; excellent efficacy for a re-establishing population at 112 DAT.
28876	Talus 40SC (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Microphylla'	Field Container	Frank	NC	2009	Foliar	Excellent control at 21.5 fl oz per 100 gal; equal to Acephate
28876	Talus 40SC (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Radicans'	Field Container	Kunkel	DE	2011	Foliar	Significantly increased mortality with 21.5 fl oz per 100 gal applied once; better than horticultural oil applied twice.
28876	Talus 40SC (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Mycrophylla'	Field Container	Ludwig	TX	2008	Foliar	Fair to good efficacy at 21.5 fl oz per 100 gal.

28876	Talus 40SC (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Sunspot'	Field Container	Nielsen	OH	2009	Foliar	Excellent control at 21.5 fl oz per 100 gal
34215	Talus 70DF (Buprofezin)	IRAC 16	Scale, Cycad (Aulacaspis yasumatsui)	Sago Palm (Cycas revoluta)	Field Container	Dale	FL	2019	Foliar	Excellent control of adults but no nymph control with 14 oz per 100 gal applied twice biweekly; one of 2 best treatments.
33579	Talus 70DF (Buprofezin)	IRAC 16	Crape Myrtle Bark Scale (Eriococcus lagerstroemia)	Crape Myrtle (Lagerstroemia indica) 'Natchez'	Field Container	Vafaie	TX	2018	Foliar	Data had too much variation to provide reliable results. Researcher's preliminary conclusions demonstrate reliable scale suppression with Talus at 14 oz per 100 gal, comparable to the standard Distance.
29587	Talus 70DF (Buprofezin)	IRAC 16	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field In- Ground	Braman	GA	2015	Foliar	Good control with 14 oz per 100 gal.
29860	Talus 70DF (Buprofezin)	IRAC 16	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field Container	Chen	LA	2015	Foliar	Excellent control with 14 oz per 100 gal; comparable to standards Ultra-Pure Oil and Distance.
29860	Talus 70DF (Buprofezin)	IRAC 16	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field Container	Chen	LA	2015	Foliar	Excellent control with 14 oz per 100 gal; comparable to standards Ultra-Pure Oil and Distance.
29860	Talus 70DF (Buprofezin)	IRAC 16	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica) C. sasanqua 'Showa-no- sakae'	Field Container	Frank	NC	2010	Foliar	Excellent control with 14 oz per 100 gal.
29587	Talus 70DF (Buprofezin)	IRAC 16	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field In- Ground	Ludwig	TX	2008	Foliar	No significant efficacy at 21.5 fl oz per 100 gal; high mortality in untreated Check.
32356	Talus 70DF (Buprofezin)	IRAC 16	Scale, Tea (Fiorinia theae)	Sasanqua camellia (Camellia)	Field Container	Chen	LA	2014	Foliar	Significantly reduced infestation with 14 oz per 100 gal applied once;

				sasanqua) 'Mountain Snow'						comparable to standard SuffOil-X.
32850	Talus 70DF (Buprofezin)	IRAC 16	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.) 'Nellie Stevens'	Field Container	Chong	SC	2015	Foliar	Great efficacy with 14 oz per 100 gal applied once; one of 3 most effective treatments.
30232	Talus 70DF (Buprofezin)	IRAC 16	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Field Container	Frank	NC	2011	Foliar	Significantly reduced adults and immatures with 14 oz per 100 gal applied once; comparable to horticultural oil.
32155	Talus 70DF (Buprofezin)	IRAC 16	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Greenhouse	Frank	NC	2012	Foliar	Did not significantly reduce immatures with 14 oz per 100 gal applied once.
30304	Talus 70DF (Buprofezin)	IRAC 16	Cottony Cushion Scale (Icerya purchasi)	Cheesewood (Pittosporum sp.) P. tobira 'Verigata'	Field In- Ground	Chong	SC	2011	Foliar	Significantly reduced immatures with 14 oz per 100 gal applied once; generally better than the standard Orthene.
30460	Talus 70DF (Buprofezin)	IRAC 16	Cottony Cushion Scale (Icerya purchasi)	Cheesewood (Pittosporum sp.) P. tobira cv.'variegata'	Field Container	Chong	SC	2012	Foliar	No consistent and significant reduction of scale population with 14 oz per 100 gal; comparable to standard paraffinic oil.
32854	Talus 70DF (Buprofezin)	IRAC 16	Camelia Scale (Lepidosaphes camelliae)	Camellia (Camellia japonica) C. japonica and C. sasanqua	Commercial Landscape	Chong	SC	2014	Foliar	Excellent efficacy with 14 oz per 100 gal applied once; would require a second application for longer residual control.
30242	Talus 70DF (Buprofezin)	IRAC 16	Gloomy Scale (Melanaspis tenebricosa)	Maple (Acer sp.) A. rubrum	Field In- Ground	Frank	NC	2011	Foliar	Excellent control of adults and immatures with 14 oz per 100 gal applied once; comparable to standard paraffin oil.
30242	Talus 70DF (Buprofezin)	IRAC 16	Gloomy Scale (Melanaspis tenebricosa)	Maple (Acer sp.) A. rubrum	Field In- Ground	Frank	NC	2014	Foliar	Data inconclusive because there were no significant differences between treatments, including untreated check.
31291	Talus 70DF (Buprofezin)	IRAC 16	Scale, Magnolia (Neolecanium cornuparvum)	Sweet Bay (Magnolia virginiana) M.	Field In- Ground	Braman	GA	2012	Foliar	Good control of false oleander scale immatures

				grandiflora, 'Little Gem'						with 14 oz per 100 gal; inferior to Orthene.
33550	Talus 70DF (Buprofezin)	IRAC 16	Lobate Lac Scale (Paratachardina pseudolobata)	Rosemallow (Hibiscus sp.) H. rosa-sinensis 'Dainty White'	Field Container	Cheng	HI	2018	Foliar	Efficacy with 14 oz per 100 gal slightly inferior to imidacloprid. No phytotoxicity.
29773	Talus 70DF (Buprofezin)	IRAC 16	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Nielsen	OH	2010	Foliar	Excellent efficacy at 14 oz per 100 gal.
29773	Talus 70DF (Buprofezin)	IRAC 16	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Nielsen	OH	2011	Foliar	Excellent efficacy with 14 oz per 100 gal.
29773	Talus 70DF (Buprofezin)	IRAC 16	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In- Ground	Persad	OH	2015	Foliar	Excellent control with 14 oz per 100 gal applied 3 times weekly.
33855	Talus 70DF (Buprofezin)	IRAC 16	False Oleander Scale (Pseudaulacaspis cockerelli)	Japanese Laurel (Aucuba japonica)	Field Container	Held	AL	2018	Foliar	Poor control with 14 oz per 100 gal. Researcher commented that application timing used in this trial might have been too early to provide adequate control for this insect.
34255	Talus 70DF (Buprofezin)	IRAC 16	False Oleander Scale (Pseudaulacaspis cockerelli)	Aucuba (Aucuba sp.)	Field Container	Held	AL	2019	Foliar	Poor efficacy with 14 oz per 100 gal applied twice biweekly..
32402	Talus 70DF (Buprofezin)	IRAC 16	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora) 'Little Gem'	Field Container	Chen	LA	2014	Foliar	Excellent control with 14 oz per 100 gal applied once; comparable to standard SuffOil-X.
29634	Talus 70DF (Buprofezin)	IRAC 16	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora)	Commercial Landscape	Chong	SC	2010	Foliar	Litchfield, SC: Significantly reduced false oleander scale population at 14 oz per 100 gal; comparable to the standard Paraffinic oil; no injury observed.
33834	Talus 70DF (Buprofezin)	IRAC 16	Scale, Hala (Thysanococcus pandani)	Hala (Pandanus sp.)	Field Container	Cheng	HI	2019	Foliar	Good efficacy with 14 oz per 100 gal applied twice biweekly. No phytotoxicity.

29758	Talus 70DF (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Braman	GA	2014	Foliar	Excellent control with 14 oz per 100 gal.
29758	Talus 70DF (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Frank	NC	2010	Foliar	Excellent control with 14 oz per 100 gal; slower acting than horticultural oil.
29758	Talus 70DF (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Green Spire'	Field Container	Gilrein	NY	2011	Foliar	Excellent control with 14 oz per 100 gal applied once.
29983	Talus 70DF (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Coloratus'	Field In- Ground	Nielsen	OH	2008	Foliar	Good efficacy at 14 oz per 100 gal.
29758	Talus 70DF (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Moonshadow'	Field Container	Potter	KY	2010	Foliar	Significantly reduced 1st generation adult scales with 21.5 fl oz per 100 gal; better than horticultural oil.
29758	Talus 70DF (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Emerald N Gold'	Field Container	Potter	KY	2014	Foliar	Did not significantly reduce scales with 14 oz per 100 gal applied at crawler stage.
25163	Talus WP (Buprofezin)	IRAC 16	Fletcher Scale (Parthenolecanium fletcheri)	Hybrid Yew (Taxus X media) 'Densiformis'	Field In- Ground	Davis	MI	2004	Foliar	Mediocre to good efficacy.
26135	Talus WP (Buprofezin)	IRAC 16	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Ludwig	TX	2003	Foliar	Excellent efficacy at 0.6, 1.2 and 2.4 lb ai per 100 gallons
32357	Tank Mix: Distance + TriStar (Pyriproxifen + acetamiprid)	IRAC 7C + IRAC 4A	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field In- Ground	Braman	GA	2015	Foliar	Very good control with 12 fl oz + 12 fl oz per 100 gal.

32873	Tank Mix: Distance + TriStar (Pyriproxifen + acetamiprid)	IRAC 7C + IRAC 4A	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field Container	Chen	LA	2015	Foliar	Excellent control with 12 fl oz + 12 fl oz per 100 gal; comparable to standards Ultra-Pure Oil and Distance.
32849	Tank Mix: Distance + TriStar (Pyriproxifen + acetamiprid)	IRAC 7C + IRAC 4A	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.) 'Nellie Stevens'	Field Container	Chong	SC	2015	Foliar	Good efficacy with 12 + 12 fl oz per 100 gal applied twice every 21 days; one of 3 most effective treatments.
32849	Tank Mix: Distance + TriStar (Pyriproxifen + acetamiprid)	IRAC 7C + IRAC 4A	Scale, Tea (Fiorinia theae)	Holly (Ilex sp.)	Field Container	Frank	NC	2015	Foliar	Did not reduce number of adults and nymphs.
32343	Tank Mix: Distance + TriStar (Pyriproxifen + acetamiprid)	IRAC 7C + IRAC 4A	Euonymus Scale (Unaspis euonymi)	Wintercreeper (Euonymus fortunei)	Field Container	Potter	KY	2015	Foliar	Scale failed to establish; no usable data were able to be collected
28138	Tank Mix: Safari + Pentrabark (Dinotefuron + Pentrabark)	IRAC 4A +	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2008	Drench	Experiment 1: Did not significantly reduce scale population at 12 g per indbh; similar to Orthene std; untreated population very low and no statistical differences were observed.
34216	TetraCURB Concentrate (Rosemary Oil)	IRAC UNE	Scale, Cycad (Aulacaspis yasumatsui)	Sago Palm (Cycas revoluta)	Field Container	Dale	FL	2019	Foliar	No significant control of nymphs and adults with 128 fl oz per 100 gal applied 5 times weekly.
34256	TetraCURB Concentrate (Rosemary Oil)	IRAC UNE	False Oleander Scale (Pseudaulacaspis cockerelli)	Aucuba (Aucuba sp.)	Field Container	Held	AL	2019	Foliar	Poor efficacy with 128 fl oz per 100 gal applied 5 times weekly.
33835	TetraCURB Concentrate (Rosemary Oil)	IRAC UNE	Scale, Hala (Thysanococcus pandani)	Hala (Pandanus sp.)	Field Container	Cheng	HI	2019	Foliar	Mediocre efficacy with 128 fl oz per 100 gal applied once. No phytotoxicity.
35087	TetraCURB Max (castor oil + rosemary oil + clove oil + peppermint oil)		Scale, Hemispherical; brown shield (Saissetia coffeae)	Coontie palm (Zamia integrifolia)	Field Container	Dale	FL	2022	Foliar	Great reduction in populations 14 DAT with 256 fl oz per 100 oz; excellent efficacy for a re-establishing population at 112 DAT.

34217	TetraCURB Organic (Rosemary Oil)	IRAC UNE	Scale, Cycad (Aulacaspis yasumatsui)	Sago Palm (Cycas revoluta)	Field Container	Dale	FL	2019	Foliar	No significant control of nymphs and adults with 128 fl oz per 100 gal applied 5 times weekly.
34257	TetraCURB Organic (Rosemary Oil)	IRAC UNE	False Oleander Scale (Pseudaulacaspis cockerelli)	Aucuba (Aucuba sp.)	Field Container	Held	AL	2019	Foliar	Poor efficacy with 128 fl oz per 100 gal applied 5 times weekly.
33836	TetraCURB Organic (Rosemary Oil)	IRAC UNE	Scale, Hala (Thysanococcus pandani)	Hala (Pandanus sp.)	Field Container	Cheng	HI	2019	Foliar	Poor efficacy with 128 fl oz per 100 gal applied once. No phytotoxicity.
29588	Triact (Clarified hydrophobic extract of neem oil)	IRAC UN	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica)	Field In-Ground	Ludwig	TX	2008	Foliar	No significant efficacy at 2 gal per 100 gal; high mortality in untreated Check.
29584	Triact (Clarified hydrophobic extract of neem oil)	IRAC UN	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) 'Microphylla'	Field Container	Ludwig	TX	2008	Foliar	Good efficacy at 2 gal per 100 gal.
28699	TriStar 30SG (Acetamiprid)	IRAC 4A	Scale, Holly Pit (Asterolecanium puteanum)	Holly (Ilex sp.) 'East Palatka'	Field In-Ground	Buss	FL	2009	Foliar	Did not significantly reduce number of immatures at 8 oz per 100 gal + Capsil. 42% control with HendersonsTilton 6 WAT.
25772	TriStar 30SG (Acetamiprid)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Indian Hawthorn (Raphiolepis indica)	Field Container	Ludwig	TX	2005	Foliar	By 41 DAT, excellent efficacy on nymphs and adults at both rates
25776	TriStar 30SG (Acetamiprid)	IRAC 4A	Florida Red Scale (Chrysomphalus aonidum)	Holly, Chinese (Ilex cornuta) 'Dwarf Buford'	Field Container	Ludwig	TX	2005	Foliar	No significant control of nymphs and on adults at 4 and 8 oz per 100 gal probably due to cooler temperatures
28691	TriStar 30SG (Acetamiprid)	IRAC 4A	False Florida Red Scale (Chrysomphalus bifasciculatus)	Holly, Chinese (Ilex cornuta) 'Cassina'	Field In-Ground	Chong	SC	2009	Foliar	Good efficact at 8 oz per 100 gal + Capsil; similar to paraffinic oil std.
28881	TriStar 30SG (Acetamiprid)	IRAC 4A	Scale, Oystershell (Diaspidiotus ostreiformis)	Silverbell Carolina (Halesia carolina var. carolina)	Field In-Ground	Nielsen	OH	2008	Foliar	Very low infestation; no control at 4 and 8 oz per 100 gal

30233	TriStar 30SG (Acetamiprid)	IRAC 4A	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Sacred Bamboo (<i>Nandina domestica</i>) 'Harbour Dwarf'	Field Container	Frank	NC	2011	Foliar	Significantly reduced adults and immatures with 8 oz per 100 gal applied twice; comparable to horticultural oil.
30305	TriStar 30SG (Acetamiprid)	IRAC 4A	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Cheesewood (<i>Pittosporum</i> sp.) <i>P. tobira</i> 'Verigata'	Field In-Ground	Chong	SC	2011	Foliar	Significantly reduced immatures with 8 oz per 100 gal applied twice; comparable to the standard Orthene.
30088	TriStar 30SG (Acetamiprid)	IRAC 4A	Camelia Scale (<i>Lepidosaphes camelliae</i>)	Camellia (<i>Camellia japonica</i>)	Commercial Landscape	Chong	SC	2010	Foliar	Did not significantly reduce camellia scale population at 8 oz per 100 gal + Capsil; comparable to all other treatments including the standard Orthene; no injury observed.
27995	TriStar 30SG (Acetamiprid)	IRAC 4A	Wax Myrtle Scale (<i>Melanaspis deklei</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Commercial Landscape	Chong	SC	2008	Foliar	Experiment 1: Did not significantly reduce scale population at 4 and 8 oz per 100 gal; similar to Orthene std; untreated population very low and no statistical differences were observed.
27995	TriStar 30SG (Acetamiprid)	IRAC 4A	Wax Myrtle Scale (<i>Melanaspis deklei</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Commercial Landscape	Chong	SC	2009	Foliar	Did not significantly reduce scale population at 8 oz per 100 gal + Capsil; similar to Orthene std; very low non treated population so no statistical significance.
30243	TriStar 30SG (Acetamiprid)	IRAC 4A	Gloomy Scale (<i>Melanaspis tenebricosa</i>)	Maple (<i>Acer</i> sp.) <i>A. rubrum</i>	Field In-Ground	Frank	NC	2011	Foliar	Excellent control of adults and immatures with 8 oz per 100 gal applied twice; comparable to standard paraffin oil.
30243	TriStar 30SG (Acetamiprid)	IRAC 4A	Gloomy Scale (<i>Melanaspis tenebricosa</i>)	Maple (<i>Acer</i> sp.) <i>A. rubrum</i>	Field In-Ground	Frank	NC	2014	Foliar	Data inconclusive because there were no significant differences between treatments, including untreated check.

25447	TriStar 30SG (Acetamiprid)	IRAC 4A	Cottony Maple Scale (<i>Neopulvinaria innumerabilis</i>)	Maple, Silver (<i>Acer saccharinum</i>)	Field In-Ground	Davis	MI	2005	Foliar	No to mediocre efficacy
29774	TriStar 30SG (Acetamiprid)	IRAC 4A	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In-Ground	Nielsen	OH	2010	Foliar	Excellent efficacy at 8 oz per 100 gal.
29774	TriStar 30SG (Acetamiprid)	IRAC 4A	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In-Ground	Nielsen	OH	2011	Foliar	Excellent efficacy with 8 oz per 100 gal.
29635	TriStar 30SG (Acetamiprid)	IRAC 4A	False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	Magnolia, Southern (<i>Magnolia grandiflora</i>)	Commercial Landscape	Chong	SC	2010	Foliar	Charleston, SC: Did not significantly reduce false oleander scale population at 8 oz per 100 gal; comparable to the standard Orthene; no injury observed.
28955	TriStar 30SG (Acetamiprid)	IRAC 4A	White Peach Scale (<i>Pseudaulacaspis pentagona</i>)	Holly, Blue (<i>Ilex x meserveae</i>)	Field In-Ground	Kunkel	DE	2009	Foliar	Mortality in untreated controls was high; no conclusions can be drawn.
28877	TriStar 30SG (Acetamiprid)	IRAC 4A	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) 'Microphylla'	Field Container	Frank	NC	2009	Foliar	Excellent control at 8 oz per 100 gal + Dyne-amic; slower acting than Acephate
28877	TriStar 30SG (Acetamiprid)	IRAC 4A	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>)	Field Container	Frank	NC	2010	Foliar	Excellent control with 8 oz per 100 gal; slower acting than horticultural oil.
28877	TriStar 30SG (Acetamiprid)	IRAC 4A	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) 'Green Spire'	Field Container	Gilrein	NY	2011	Foliar	Did not significantly reduce population with 8 oz per 100 gal + Capsil applied twice.
28877	TriStar 30SG (Acetamiprid)	IRAC 4A	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus japonicus</i>) <i>E. fortunei</i> 'Radicans'	Field Container	Kunkel	DE	2011	Foliar	Significantly increased mortality with 8 oz per 100 gal + Capsil applied twice; comparable to horticultural oil applied twice.
28877	TriStar 30SG (Acetamiprid)	IRAC 4A	Euonymus Scale (<i>Unaspis euonymi</i>)	Spindle Tree, Japanese (<i>Euonymus</i>)	Field Container	Ludwig	TX	2008	Foliar	Fair efficacy at 8 oz per 100 gal.

				japonicus) 'Microphylla'						
29984	TriStar 30SG (Acetamiprid)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Coloratus'	Field In- Ground	Nielsen	OH	2008	Foliar	Good efficacy at 8 oz per 100 gal.
28877	TriStar 30SG (Acetamiprid)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. vegetus 'Sunspot'	Field Container	Nielsen	OH	2009	Foliar	Poor control at 8 oz + 6 oz Capsil per 100 gal
28877	TriStar 30SG (Acetamiprid)	IRAC 4A	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Moonshadow'	Field Container	Potter	KY	2010	Foliar	Significantly reduced 1st generation adult scales with 12 fl oz per 100 gal; better than horticultural oil; no impact on 2nd generation.
25219	TriStar 70WSP (Acetamiprid)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) 'Dwarf Buford'	Field Container	Ludwig	TX	2004	Foliar	Excellent efficacy at 32, 64, and 128 g per 100 gal at 45DAT.
25219	TriStar 70WSP (Acetamiprid)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) 'China Doll'	Field Container	Ludwig	TX	2005	Foliar	Minimal impact on adults; excellent efficacy on nymphs at 28 DAT at 4 oz and 8 oz per 100 gal
25219	TriStar 70WSP (Acetamiprid)	IRAC 4A	Florida Wax Scale (Ceroplastes floridensis)	Holly (Ilex sp.) I. cornuta 'bufordii nana'	Field Container	Ludwig	TX	2005	Foliar	Minimal impact on nymphs; excellent efficacy on adults by 56 DAT at both 4 and 8 oz per 100 gal
25147	TriStar 70WSP (Acetamiprid)	IRAC 4A	Scale, Oystershell (Diaspidiotus ostreiformis)	Silverbell Carolina (Halesia carolina var. carolina)	Field In- Ground	Nielsen	OH	2005	Foliar	No control at 48 g/100 gal, good control at 96 g/100 gal
25146	TriStar 70WSP (Acetamiprid)	IRAC 4A	Scale, Oystershell (Diaspidiotus ostreiformis)	Lilac, Common (Syringa vulgaris) 'Sensation'	Field In- Ground	Nielsen	OH	2005	Foliar	No to poor control at 48 and 96 g per 100 gal
25317	TriStar 70WSP (Acetamiprid)	IRAC 4A	Scale, Elongate Hemlock (Fiorinia externa)	Fir, Fraser (Abies fraseri)	Field In- Ground	Cowles	CT	2005	Foliar	Excellent efficacy

25058	TriStar 70WSP (Acetamiprid)	IRAC 4A	Cottony Cushion Scale (<i>Icerya purchasi</i>)	Ternstroemia (<i>Ternstroemia</i> sp.) <i>T. gymnanthera</i>	Field Container	Ludwig	TX	2005	Foliar	Good efficacy with 124 oz per 100 gallon rate almost to the level of Orthene TTO 97 standard
25155	TriStar 70WSP (Acetamiprid)	IRAC 4A	Winged Euonymus Scale (<i>Lepidosaphes yanagicola</i>)	Burning Bush (<i>Euonymus alatus</i>)	Field Container	Freiberger	NJ	2004	Foliar	Some efficacy at 64 g per 100 gal rate.
25155	TriStar 70WSP (Acetamiprid)	IRAC 4A	Winged Euonymus Scale (<i>Lepidosaphes yanagicola</i>)	Burning Bush (<i>Euonymus alatus</i>)	Field Container	Freiberger	NJ	2005	Foliar	Little efficacy at either rate
25117	TriStar 70WSP (Acetamiprid)	IRAC 4A	Fletcher Scale (<i>Parthenolecanium fletcheri</i>)	Hybrid Yew (<i>Taxus X media</i>) 'Densiformis'	Field In-Ground	Davis	MI	2004	Foliar	Good efficacy.
25053	TriStar 70WSP (Acetamiprid)	IRAC 4A	False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	<i>Aucuba</i> (<i>Aucuba</i> sp.)	Field Container	Ludwig	TX	2004	Foliar	No impact on number of adults or nymphs and some reduction in percent alive at the higher two rates (32, 64, 128 g per 100 gal).
33856	TriStar 8.5SL (Acetamiprid)	IRAC 4A	False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	Japanese Laurel (<i>Aucuba japonica</i>)	Field Container	Held	AL	2018	Foliar	Poor control with 16.5 fl oz per 100 gal. Researcher commented that application timing used in this trial might have been too early to provide adequate control for this insect.
32875	Ultra Pure Oil (BASF) (Mineral oil)	FRAC NC	Scale, Tea (<i>Fiorinia theae</i>)	<i>Camellia</i> (<i>Camellia japonica</i>)	Field Container	Chen	LA	2015	Foliar	Great control with 12 fl oz per 100 gal.
34181	V-10433 (V-10433)		Crape Myrtle Bark Scale (<i>Eriococcus lagerstroemia</i>)	Crape Myrtle (<i>Lagerstroemia indica</i>)	Field Container	Held	AL	2020	Foliar	No control with 11 fl oz per 100 gal applied 5 times every 3-4 days.
34181	V-10433 (V-10433)		Crape Myrtle Bark Scale (<i>Eriococcus lagerstroemia</i>)	Crape Myrtle (<i>Lagerstroemia indica</i>) 'Natchez'	Field Container	Held	AL	2021	Foliar	Poor efficacy on crawlers and adults when applied at 11 fl oz per 100 gal five times.
35088	V-10433 (V-10433)		Scale, Hemispherical; brown shield (<i>Saissetia coffeae</i>)	Coontie palm (<i>Zamia integrifolia</i>)	Field Container	Dale	FL	2022	Foliar	Virtually no reduction in populations 14 and 28 DAT with 11 fl oz per 100 oz; excellent efficacy for a

										re-establishing population at 112 DAT.
35483	Velifer (<i>Beauveria bassiana</i> Strain PPRI 5339)	IRAC UNF	Scale, Hemispherical; brown shield (<i>Saissetia coffeae</i>)	Coontie palm (<i>Zamia integrifolia</i>)	Field Container	Dale	FL	2022	Foliar	Good reduction in populations 14 DAT with 13 fl oz per 100 oz; excellent efficacy for a re-establishing population at 112 DAT.
34218	Ventigra Insecticide (Afidopyropen)	IRAC 9D	Scale, Cycad (<i>Aulacaspis yasumatsui</i>)	Sago Palm (<i>Cycas revoluta</i>)	Field Container	Dale	FL	2019	Foliar	Good and excellent control of nymphs and adults with 7 fl oz per 100 gal applied once; one of 2 best treatments.
33580	Ventigra Insecticide (Afidopyropen)	IRAC 9D	Crape Myrtle Bark Scale (<i>Eriococcus lagerstroemia</i>)	Crape Myrtle (<i>Lagerstroemia indica</i>) 'Natchez'	Field Container	Vafaie	TX	2018	Foliar	Data had too much variation to provide reliable results.
32352	Ventigra Insecticide (Afidopyropen)	IRAC 9D	Scale, Tea (<i>Fiorinia theae</i>)	Camellia (<i>Camellia japonica</i>)	Field In-Ground	Braman	GA	2015	Foliar	Very good control with 7 fl oz per 100 gal applied 3 times biweekly.
32844	Ventigra Insecticide (Afidopyropen)	IRAC 9D	Scale, Tea (<i>Fiorinia theae</i>)	Holly (<i>Ilex</i> sp.) 'Nellie Stevens'	Field Container	Chong	SC	2015	Foliar	Good efficacy with 7 fl oz per 100 gal + oil applied 3 times biweekly; comparable to Distance.
32844	Ventigra Insecticide (Afidopyropen)	IRAC 9D	Scale, Tea (<i>Fiorinia theae</i>)	Holly (<i>Ilex</i> sp.)	Field Container	Frank	NC	2015	Foliar	Did not reduce number of adults and nymphs with 7 fl oz per 100 gal applied twice biweekly.
33548	Ventigra Insecticide (Afidopyropen)	IRAC 9D	Lobate Lac Scale (<i>Paratachardina pseudolobata</i>)	Rosemallow (<i>Hibiscus</i> sp.) <i>H. rosa-sinensis</i> 'Dainty White'	Field Container	Cheng	HI	2018	Foliar	Efficacy with 4.8 and 7 fl oz per 100 gal slightly inferior to imidacloprid. No phytotoxicity.
32286	Ventigra Insecticide (Afidopyropen)	IRAC 9D	Scale, Pine Needle (<i>Phenacaspis pinifoliae</i>)	Pine (<i>Pinus</i> sp.) <i>P. sylvestris</i>	Field In-Ground	Persad	OH	2015	Foliar	Excellent control with 7 fl oz per 100 gal + Ultra Pure Oil applied 3 times weekly.
33857	Ventigra Insecticide (Afidopyropen)	IRAC 9D	False Oleander Scale (<i>Pseudaulacaspis cockerelli</i>)	Japanese Laurel (<i>Aucuba japonica</i>)	Field Container	Held	AL	2018	Foliar	Poor control with 4.8 and 7 fl oz per 100 gal + UltraPure Oil. Researcher commented that application timing used in this trial might have been too early to provide adequate control for this insect.

34258	Ventigra Insecticide (Afidopyropen)	IRAC 9D	False Oleander Scale (Pseudaulacaspis cockerelli)	Aucuba (Aucuba sp.)	Field Container	Held	AL	2019	Foliar	Poor efficacy with 7 fl oz per 100 gal applied twice biweekly.
35089	Ventigra Insecticide (Afidopyropen)	IRAC 9D	Scale, Hemispherical; brown shield (Saissetia coffeae)	Coontie palm (Zamia integrifolia)	Field Container	Dale	FL	2022	Foliar	Good reduction in populations 14 DAT with 7 oz per 100 oz; excellent efficacy for a re-establishing population at 112 DAT.
33837	Ventigra Insecticide (Afidopyropen)	IRAC 9D	Scale, Hala (Thysanococcus pandani)	Hala (Pandanus sp.)	Field Container	Cheng	HI	2019	Foliar	Poor and mediocre efficacy with 4.8 and 7 fl oz per 100 gal applied twice biweekly. No phytotoxicity.
32339	Ventigra Insecticide (Afidopyropen)	IRAC 9D	Euonymus Scale (Unaspis euonymi)	Wintercreeper (Euonymus fortunei)	Field Container	Potter	KY	2015	Foliar	Scale failed to establish; no usable data were able to be collected
31486	Xxpire 40WG (Spinetoram + sulfoxafloz)	IRAC 5 + IRAC 4C	Scale, Calico (Eulecanium cerasorum)	Locust (Gleditsia sp.) G. triacanthos var. inermis	Commercial Landscape	Persad	OH	2014	Foliar	Increasing efficacy on nymphs (poor to good by 28 DAT) with increasing rates (2, 2.75 and 3.5 fl oz per 100 gal).
32034	Xxpire 40WG (Spinetoram + sulfoxafloz)	IRAC 5 + IRAC 4C	Scale, Tea (Fiorinia theae)	Camellia (Camellia japonica) 'In the Pink'	Field Container	Arthurs (UF)	FL	2014	Foliar	Excellent control with 2.0, 2.75 and 3.5 oz per 100 gal + Capsil applied twice; comparable to SuffOil X.
32405	Xxpire 40WG (Spinetoram + sulfoxafloz)	IRAC 5 + IRAC 4C	Scale, Tea (Fiorinia theae)	Sasanqua camellia (Camellia sasanqua) 'Mountain Snow'	Field Container	Chen	LA	2014	Foliar	Significantly reduced infestation with 2, 2.75 and 3.5 oz per 100 gal + Capsil applied twice; best treatment.
32150	Xxpire 40WG (Spinetoram + sulfoxafloz)	IRAC 5 + IRAC 4C	Cottony Cushion Scale (Icerya purchasi)	Sacred Bamboo (Nandina domestica) 'Harbour Dwarf'	Greenhouse	Frank	NC	2012	Foliar	Significantly reduced immatures with 3.5 and 7 oz per 100 gal applied twice; comparable to horticultural oil.
31284	Xxpire 40WG (Spinetoram + sulfoxafloz)	IRAC 5 + IRAC 4C	Cottony Cushion Scale (Icerya purchasi)	Cheesewood (Pittosporum sp.) P. tobira cv. 'variegata'	Field Container	Chong	SC	2012	Foliar	No consistent and significant reduction of scale population with 3.5 and 7 oz per 100 gal; comparable to standard paraffinic oil.

31543	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	Camelia Scale (Lepidosaphes camelliae)	Camellia (Camellia japonica) C. japonica and C. sasanqua	Commercial Landscape	Chong	SC	2014	Foliar	Consistent and high efficacy with 2.75 and 3.5 oz per 100 gal + Capsil applied twice biweekly; comparable to the standard paraffin oil.
31545	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	Wax Myrtle Scale (Melanaspis deklei)	Wax Myrtle (Myrica cerifera)	Commercial Landscape	Chong	SC	2013	Foliar	Significantly reduced scale population with 2.0, 2.75 and 3.5 oz per 100 gal + Capsil applied twice biweekly; comparable to the standard paraffin oil.
32528	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	Gloomy Scale (Melanaspis tenebricosa)	Maple (Acer sp.) A. rubrum	Field In-Ground	Frank	NC	2014	Foliar	Data inconclusive because there were no significant differences between treatments, including untreated check.
31289	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	Scale, Magnolia (Neolecanium cornuparvum)	Sweet Bay (Magnolia virginiana) M. grandiflora, 'Little Gem'	Field In-Ground	Braman	GA	2012	Foliar	Excellent control of false oleander scale immatures with 3.5 and 7 oz per 100 gal; comparable to Orthene.
31354	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In-Ground	Jones	OH	2012	Foliar	Mediocre and good control with 3.5 and 7 oz per 100 gal applied twice.
31354	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. sylvestris	Field In-Ground	Jones	OH	2013	Foliar	Good control with 2.0, 2.75 and 3.5 oz per 100 gal + Capsil.
31354	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	Scale, Pine Needle (Phenacaspis pinifoliae)	Pine (Pinus sp.) P. strobus	Field In-Ground	Sadof	IN	2015	Foliar	Significant efficacy on immatures and adults with 2.75 and 3.5 oz + Capsil per 100 gal; comparable to the standards Distance and Horticultural Oil.
32399	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora) 'Little Gem'	Field Container	Chen	LA	2014	Foliar	Good to excellent control with 2, 2.75 and 3.5 oz per 100 gal + Capsil applied twice; comparable to standard SuffOil-X.
31544	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	False Oleander Scale (Pseudaulacaspis cockerelli)	Magnolia, Southern (Magnolia grandiflora)	Commercial Landscape	Chong	SC	2014	Foliar	Good control with 2.0, 2.75 and 3.5 oz per 100 gal + Capsil applied twice biweekly; comparable to the standard paraffin oil.

32344	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	Euonymus Scale (Unaspis euonymi)	Wintercreeper (Euonymus fortunei)	Field Container	Potter	KY	2015	Foliar	Scale failed to establish; no usable data were able to be collected
32157	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus)	Field Container	Braman	GA	2014	Foliar	Excellent control with 2, 2.75 and 3.5 fl oz per 100 gal + Capsil applied twice at 14-day interval.
32157	Xxpire 40WG (Spinetoram + sulfoxaflor)	IRAC 5 + IRAC 4C	Euonymus Scale (Unaspis euonymi)	Spindle Tree, Japanese (Euonymus japonicus) E. fortunei 'Emerald N Gold'	Field Container	Potter	KY	2014	Foliar	Significantly reduced scales (up to 75%) with 2, 2.75 and 3.5 oz per 100 gal + Capsil applied at crawler stage and 2 weeks later; comparable to Orthene.

Label Suggestions

Based upon data contained within this summary, we suggest that Syngenta consider adding tea scale (*Fiorinia theae*) to the Mainspring label. Similarly, we suggest that Dow consider adding this pest to the XXpire label. BASF may consider adding Madeira mealybug to the Ventigra label.

If additional data are available for scale species, we recommend the ISM-555 label lists crape myrtle bark scale and hemispherical scale when registered.

If additional data are available, we also recommend RTSA-721 include crapemyrtle bark scale and magnolia scale.

Appendix 1: Contributing Researchers

Dr. Steven Arthurs <i>(past affiliate)</i>	University of Florida - IFAS Mid Florida Research & Education Center 2725 Binion Rd Apopka FL 32703
Dr. Kris Braman	University of Georgia Department of Entomology Griffin Campus Griffin, GA 30223-1797
Dr. Eileen Buss	University of Florida Entomology & Nematology Department P. O. Box 110620 Gainesville, FL 32611-0620
Dr. Yan Chen	Louisiana State University AgCenter Hammond Research Station 21549 Old Covington Hwy. Hammond, LA 70403
Dr. Zhiqiang Cheng	University of Hawaii 3050 Maile Way Gilmore Hall 609A Honolulu, HI 96822
Dr. Juang-Horng Chong <i>(past affiliate)</i>	Clemson University Department of Entomology, Soils & Plant Sciences Clemson, SC 29634
Dr. Rich Cowles	Connecticut Agricultural Experiment Station, Valley Lab 153 Cook Hill Road P. O. Box 248 Windsor, CT06095-0248
Dr. Adam Dale	University of Florida 1881 Natural Area Drive Gainesville, FL 32611
Dr. Steven Frank	North Carolina State University Department of Entomology Raleigh, NC 27695
Mr. Tom Freiberger <i>(past affiliate)</i>	Rutgers University 283 Route 539 Cream Ridge, NJ

Dr. Dan Gilrein
Cornell Cooperative Extension
Long Island Horticulture Research & Experiment Station
3059 Sound Avenue
Riverhead, NY 11901

Dr. David Held
Mississippi State University
Coastal Research & Extension Center
1815 Poppo Ferry Road
Biloxi, MS 39532

Dr. Charles Hesselein
(past affiliate)
Alabama Cooperative Extension
Mobile Ornamental Horticulture Research Center
Mobile, AL 36689

Dr. Grant Jones
(past affiliate)
Davey Tree Expert Co.
396 Fenton Lane
Suite 608
West Chicago, IL 60185

Dr. Brian Kunkel
University of Delaware
248A Townsend Hall
Newark, DE 19716

Dr. Scott Ludwig
(past affiliate)
Texas Cooperative Extension
P.O. Box 38
Overton, TX 75684

Dr. Dave Nielsen
(retired)
Ohio State University, OARDC
Department of Entomology
Wooster, OH 44691

Dr. Anand Persad
(past affiliate)
The Davey Institute
1500 N, Mantua St.
Kent, OH 44240

Dr. Dan Potter
University of Kentucky
Department of Entomology
S-225 Agriculture Science Building North
Lexington, KY 40546-0091

Dr. Clifford Sadoff
Purdue University
Department of Entomology
901 West State Street
West Lafayette, IN 47907

Dr. James M. Schalk
(retired)
USDA, ARS
US Vegetable Laboratory
2700 Savannah Highway
Charleston, SC 29414

Dr. Donald Schuder
(*retired*)

Purdue University
Department of Entomology
Entomology Hall
West Lafayette, IN 47907

Dr. Dave Smitley & Terry Davis

Michigan State University
Department of Entomology
Michigan State University
East Lansing, MI 48824-1115

Dr. Erfan Vafaie

Texas AgriLifeExtension Service
1710 FM 3053 North
Overton, TX 75684

Dr. Michael L. Williams
(*retired*)

Auburn University
Department of Entomology and Plant Pathology
Auburn University, AL 36849