



# Ornamental Horticulture Program Research Project Sheet

<http://ir4.rutgers.edu/Ornamental/ornamentalProjectInformationSheets.cfm>

**Project Name:** Scale Efficacy

<b>New</b>	<b>Ongoing</b>	X	<b>Completed</b>		<b>Duration if ongoing or completed:</b>	2004 - 2015
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**Project Description:**

During the 2003 IR-4 Ornamental Horticulture Workshop certain studies were designated “Super A” to start devoting time and resources to groups of studies with the same general goal. Researching new and existing pest management tools for scale insects was one set. This concept then morphed into high priority projects. Scale insects, especially armored scale, present difficulties for growers and landscape managers. While there are several tools in different classes, product efficacy is often unknown for many species of new ornamental horticulture crops. Screening for mealybug efficacy initially occurred in 2004 and continued through 2012.

**Research Project Abstract (if available):**

*Abstract from 2013 Scale & Mealybug Efficacy Summary*

Managing scale and mealybug insects presents unique challenges. Products with contact modes of action have to 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.

Several neonicotinoids (Aloft SC/Celero 16WSG, Flagship 0.22G/25WP, Safari 2G/20SG/Transtect 70WSP, and TriStar 30SG/70WSP), insect growth regulators (Distance and Talus 40SC/70DF), and other products were tested against scales and mealybugs. All products tested generally provided excellent control of elongate hemlock scale, cryptomeria scale and gloomy scale, generally mediocre to excellent control of false oleander scale and Fletcher scale, and poor control of armored scale. Control of Florida wax scale was excellent with Flagship, Safari and TriStar, and good with Talus. Excellent magnolia white scale control was obtained with Distance, Talus, Xxpire and Mainspring. Talus was the only foliar product providing excellent control of oystershell scale; Safari applied as drench also provided excellent control. Cottony maple scale control was mediocre to good with Flagship, none to mediocre with Safari and TriStar, and poor with Talus. Control of cottony cushion scale was good to excellent with Distance, Flagship, Kontos, Rycar and TriStar, and variable with Talus, A16901B, Safari, GF-2626 and Xxpire. Euonymus scale control was good to excellent with Aloft and Distance, mediocre to good with Flagship, Safari and TriStar, and variable with Talus, A16901B and Xxpire. Calico scale control was mediocre to excellent with Safari/Transtect, good with Mainspring, and mediocre with Xxpire and Kontos. Control of false Florida red scale was good with Flagship and Safari, mediocre with Distance, and poor with Talus and TriStar. Tea scale control was excellent with Distance, Xxpire and Mainspring, and good to excellent with Safari, Kontos and Talus. Aloft was the only product providing good holly pit scale control; Distance, Flagship, Safari, Talus and TriStar provided mediocre control. Pine needle scale control was excellent with Aloft, Distance, Kontos, Rycar, Safari, Talus and Tristar; A16901B, GF-2626 and Xxpire and Kontos were less effective. In a camellia scale trial, all products tested provided poor control most likely because of unfavorable environmental conditions.

Three recently registered products (Mainspring, Rycar and XXpire) looked promising on several species based on their efficacy relative to standards. Further research is needed to obtain additional efficacy data to recommend actions to register or amend labels for these pests.

<b>Target Species (Phytotoxicity, or common and Latin name of arthropod, pathogen, weed):</b>			
Calico Scale( <i>Eulecaniumcerasorum</i> )	Cottony Cushion Scale( <i>Iceryapurchasi</i> )	Cottony Maple Scale ( <i>Neopulvinariaainnumerabilis</i> )	Elongate Hemlock ( <i>Fioriniaexterna</i> ) and Cryptomeria Scales
Euonymus Scale ( <i>Unaspiseuonymi</i> )	False Florida Red Scale ( <i>Chrysomphalusbifasciculatus</i> )	False Oleander Scale( <i>Pseudaulacaspiscockerelli</i> )	Fletcher Scale ( <i>Parthenolecaniumfletcheri</i> )
Florida Red Scale( <i>Chrysomphalusaponidum</i> )	Florida Wax Scale( <i>Ceroplastesfloridensis</i> )	Gloomy Scale ( <i>Melanaspistenebricosa</i> )	Holly Pit Scale ( <i>Asterolecaniumputeantum</i> )
	Indian Wax Scale ( <i>Ceroplastesceriferus</i> )	Magnolia Scale ( <i>Neolecaniumcornuparvum</i> )	Oystershell Scale ( <i>Diaspidiotusostreiformis</i> )
	Pine Needle Scale ( <i>Phenacaspispinifoliae</i> )	Tea Scale ( <i>Fioriniaetheae</i> )	Wax Myrtle Scale ( <i>Melanaspisdeklei</i> )
	Winged Euonymus Scale ( <i>Lepidosaphesyanagricola</i> )		
<b>Target Crops (list tested crops if ongoing or completed project)</b>			
Aucuba ( <i>Aucuba sp.</i> )	Camellia, Japanese ( <i>Camellia japonica</i> )	Euonymus sp.	Fir, Fraser ( <i>Abies fraseri</i> )
Heavenly Bamboo ( <i>Nandinadomestica</i> )	Holly ( <i>Ilex sp.</i> )	Holly, Blue ( <i>Ilex x meserveae</i> )	Holly, Chinese ( <i>Ilex cornuta</i> )
Honey Locust ( <i>Gleditsia triacanthosinermis</i> )	Indian Hawthorn ( <i>Raphiolepisindica</i> )	Japanese Aralia ( <i>Fatsia japonica</i> )	Japanese Zelkova ( <i>Zelkovaserrata</i> )
Lilac, Common ( <i>Syringa vulgaris</i> )	Magnolia, Southern ( <i>Magnolia grandiflora</i> )	Maple, Red ( <i>Acer rubrum</i> )	Maple, Silver ( <i>Acer saccharinum</i> )
			<i>Pinussylvestris</i>
			Pittosporum ( <i>Pittosporum tobira</i> )
			PurpleleafWintercreeper ( <i>Euonymus radicans</i> )
			Silverbell Carolina ( <i>Halesiacarolina var. carolina</i> )
			Spindle Tree ( <i>Euonymus japonicus</i> )
			<i>Ternstroemiagymnanthera</i>
			Wax Myrtle ( <i>Myricacerifera</i> )
			Winged Burning Bush ( <i>Euonymus alatus</i> )
			Yew ( <i>Taxus media</i> )
<b>Target Product(s)(list tested products or numbered compounds if ongoing or completed project)</b>			
A16901B	Distance	MOI 201	Talstar NF
Acephate Pro 75WSP	Flagship 25WG	Onyx	Talus 40SC
Aloft SC	Flagship 0.22G	Orthene TTO	Talus 70DF
Arena 50WDG	GF-2626 1SC	QRD 452	Talus WP
BotaniGard 22WP	Judo 2SC	Rycar	Triact
Celero 16WSG	Kontos	Safari 20SG	TriStar 30SG
Cygon 2E	Mainspring 200SC	Safari 2G	TriStar 70WSP
Diazinon 4E	Marathon II	Sun Spray Ultra-Fine oil	XXpire
Discus	Merit 2F		

Product Registration and Research Status			
	Fully Screened (also includes standards)	Partially Screened through IR-4 <sup>1</sup>	Need Data for Additional Species ?
Labeled for Scale Generally & Commercialized	Acephate Pro 75WSP Cygon 2E Diazinon 4E <b>Flagship 25WG *</b> Orthene TTO Sun Spray Ultra-Fine oil Talstar NF Talus 40SC Talus 70DF Ultra Pure Oil	Aria 20SG Discus Distance <b>Kontos*</b> <b>Safari 20SG *</b> <b>TriStar 30SG *</b>	Aloft SC <sup>2</sup> Arena 50WDG <sup>2</sup> EcoTrol Hachi-Hachi M-Pede <b>Rycar *</b> Safari 2G SuffOil X <b>Xxpire *</b>
Labeled for Scale Generally But NOT Commercialized			
Labeled for Specific Scale & Commercialized	Scimitar CS	Onyx	
Labeled for Specific Scale but NOT Commercialized			
Not yet registered or labeled for Scale		A16901B Flagship 0.22G	BotaniGard 22WP Marathon II Merit 2F <sup>2</sup>
No longer available for development for Scale	Acelepryn <b>Celero 16WSG *</b> GF-2626 1SC MOI 201 QRD 452		
* IR-4 Data contributed to registration decision – either adding pest to label or not pursuing further research			
1 At least one species screened fully			
2 Product not available for production ornamentals			

Area	Characteristic	Pro	Con
Availability & effectiveness of alternative management tools	Very few new tools for screening		X
Damage potential of target			
Performance and crop safety of proposed products (from other systems)	Need more armored scale data	X	
	Need more lac scale data	X	
Compatibility with IPM, resistance management programs	Several IRAC classes are available for resistance management		X
Economics			
Geographic distribution			
Manufacturer interest in labeling products			
Other	Successful project with data clearly contributing to expanded labels	X	
	Some labels are general, some are specific	X	X
	Sites can be difficult to locate		X



### IR-4 Efficacy Trials to Date

Average rating on a scale of 1 – 5 with 1 = 0 to about 50% efficacy (not effective) and 5 = 95 to 100 efficacy (very effective); minimum to maximum rating; number of trials (See table on next page). For product/insect combinations that are blank, IR-4 has not screened this combination.

'Labeled' indicates that this insect species or genera is listed on the label. A rating of 2 or lower is considered unacceptable efficacy (*red text*). A rating of 3 or higher is considered commercially acceptable (black text). Non-labeled, completed product/insect combinations (3 or more trials) with an average rating of 3 or higher are highlighted with *green text*. For insect/product combinations that are blank, IR-4 has not screened this combination.

Table 1 of 5

Product (Active Ingredients)	Calico Scale ( <i>Eulecanium cerasorum</i> )	Camelia Scale ( <i>Lepidosaphes camelliae</i> )	Cottony Cushion Scale ( <i>Icerya purchasi</i> )	Cottony maple scale ( <i>Neopulvinaria innumerabilis</i> )
A16901B 45WG (Cyantraniliprole + thiamethoxam)		1.0 (1 - 1) n1	2.0 (1 - 5) n4	
Acephate Pro 75 WSP (Acephate)				
Aloft SC (Clothianadin + bifenthrin)				
Arena 50WDG (Clothianadin)	3.0 (3 - 3) n1	1.0 (1 - 1) n1		
AzaGuard (Azadirachtin)				
Botanigard 22WP (Beauveria bassiana GHA)				
Celero 16WSG (Clothianidin)			1.0 (1 - 1) n1	
Cygon 2E (Dimethoate)				
Diazinon 4E (Diazinon)				
Discus (Imidacloprid + cyfluthrin)				
Distance (Pyriproxyfen)			3.3 (1 - 5) n3 Labeled	
Flagship 0.22G (Thiamethoxam)		1.0 (1 - 1) n1	3.3 (1 - 5) n4	
Flagship 25WG (Thiamethoxam)		1.0 (1 - 1) n1	4.5 (4 - 5) n2	3.0 (3 - 3) n1 Labeled
GF-2626 1SC (Sulfoxaflor)			2.0 (1 - 3) n2	
Horticultural Oil (Horticultural Oil)			2.0 (2 - 2) n1	
Judo 2SC (Spiromesifen)				
Kontos (BYI 8330 240SC) (Spirotetramat)	2.0 (2 - 2) n1 Labeled		5.0 (5 - 5) n2 Labeled	
Mainspring (A20520A) 200SC (Cyantraniliprole)	5.0 (5 - 5) n1			
Marathon II (Imidacloprid)				1.0 (1 - 1) n1 Labeled
MOI 201 (MOI 201)				
Onyx (Bifenthrin)				
Orthene TTO 97 (Valent) (Acephate)		1.0 (1 - 1) n1 Labeled	3.0 (3 - 3) n2 Labeled	
QRD 452 (Extract of <i>Chenopodium ambrosioides</i> )				
Rycar (SP3009/NNI-0101) (Pyrifluquinazon)			5.0 (5 - 5) n2	
Safari 20SG (Dinotefuran)	3.0 (1 - 5) n5 Labeled	1.0 (1 - 1) n1 Labeled	3.0 (1 - 5) n4 Labeled	1.0 (1 - 1) n2 Labeled
Safari 2G (V-10112 2G) (Dinotefuran)	1.0 (1 - 1) n1 Labeled	1.0 (1 - 1) n1 Labeled	5.0 (5 - 5) n2 Labeled	
SuffOil X (Synergy) (Petroleum Oil)				

Product (Active Ingredients)	Calico Scale ( <i>Eulecanium cerasorum</i> )	Camelia Scale ( <i>Lepidosaphes camelliae</i> )	Cottony Cushion Scale ( <i>Icerya purchasi</i> )	Cottony maple scale ( <i>Neopulvinaria innumerabilis</i> )
Sun Spray Ultra-Fine Spray Oil (Paraffinic oil)				
Talstar Flowable Insecticide/Miticide (Bifenthrin)				1.0 (1 - 1) n1
Talus 40SC (Buprofezin)				1.0 (1 - 1) n1 Labeled
Talus 70DF (Buprofezin)			3.7 (1 - 5) n3 Labeled	
Talus WP (Buprofezin)				
Triact (Clarified hydrophobic extract of neem oil)				
TriStar 30SG (Acetamiprid)		1.0 (1 - 1) n1 Labeled	5.0 (5 - 5) n2 Labeled	1.0 (1 - 1) n1 Labeled
TriStar 70WSP (Acetamiprid)			3.0 (3 - 3) n1 Labeled	
Xxpire (GF-2860) 40WG (Spinetoram + sulfoxaflor)	3.0 (3 - 3) n1 Labeled		5.0 (5 - 5) n1	

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Product (Active Ingredients)	Elongate Hemlock Scale ( <i>Fiorinia externa</i> )	Euonymus Scale ( <i>Unaspis euonymi</i> )	False Florida Red Scale ( <i>Chrysomphalus bifasciculatus</i> )	False Oleander Scale ( <i>Pseudaulacaspis cockerelli</i> )
A16901B 45WG (Cyantraniliprole + thiamethoxam)		2.3 (1 - 5) n3		1.0 (1 - 1) n1
Acephate Pro 75 WSP (Acephate)		5.0 (5 - 5) n1 Labeled		
Aloft SC (Clothianadin + bifenthrin)		4.0 (3 - 5) n2		
Arena 50WDG (Clothianadin)				
AzaGuard (Azadirachtin)				1.0 (1 - 1) n1
Botanigard 22WP ( <i>Beauveria bassiana</i> GHA)	1.0 (1 - 1) n1			
Celero 16WSG (Clothianidin)				
Cygon 2E (Dimethoate)	3.0 (3 - 3) n2	3.7 (3 - 5) n3 Labeled		
Diazinon 4E (Diazinon)		5.0 (5 - 5) n1 Labeled		
Discus (Imidacloprid + cyfluthrin)				
Distance (Pyriproxyfen)		3.9 (1 - 5) n10 Labeled	3.0 (3 - 3) n1 Labeled	4.0 (3 - 5) n2
Flagship 0.22G (Thiamethoxam)		2.2 (1 - 4) n6		2.0 (2 - 2) n1

Product (Active Ingredients)	Elongate Hemlock Scale ( <i>Fiorinia externa</i> )	Euonymus Scale ( <i>Unaspis euonymi</i> )	False Florida Red Scale ( <i>Chrysomphalus bifasciculatus</i> )	False Oleander Scale ( <i>Pseudaulacaspis cockerelli</i> )
Flagship 25WG (Thiamethoxam)	4.0 (4 - 4) n1	2.3 (1 - 4) n8	5.0 (5 - 5) n1	2.0 (2 - 2) n2
GF-2626 1SC (Sulfoxaflor)				
Horticultural Oil (Horticultural Oil)		4.3 (3 - 5) n3		
Judo 2SC (Spiromesifen)	1.0 (1 - 1) n1			
Kontos (BYI 8330 240SC) (Spirotetramat)		2.0 (1 - 3) n3 <i>Labeled</i>		1.0 (1 - 1) n1 <i>Labeled</i>
Mainspring (A20520A) 200SC (Cyantraniliprole)		3.0 (1 - 5) n2		5.0 (5 - 5) n1
Marathon II (Imidacloprid)				
MOI 201 (MOI 201)				
Onyx (Bifenthrin)	2.0 (2 - 2) n1 <i>Labeled</i>			
Orthene TTO 97 (Valent) (Acephate)		3.0 (2 - 4) n2		1.0 (1 - 1) n1 <i>Labeled</i>
QRD 452 (Extract of <i>Chenopodium ambrosioides</i> )		3.0 (3 - 3) n1		
Rycar (SP3009/NNI-0101) (Pyrifluquinazon)		2.6 (1 - 5) n7	3.0 (3 - 3) n1	2.0 (2 - 2) n1
Safari 20SG (Dinotefuran)	3.8 (2 - 5) n4 <i>Labeled</i>	3.7 (1 - 5) n10 <i>Labeled</i>	5.0 (5 - 5) n1 <i>Labeled</i>	3.0 (2 - 4) n2 <i>Labeled</i>
Safari 2G (V-10112 2G) (Dinotefuran)		4.0 (2 - 5) n5		3.0 (3 - 3) n1
SuffOil X (Synergy) (Petroleum Oil)				5.0 (5 - 5) n1
Sun Spray Ultra-Fine Spray Oil (Paraffinic oil)		5.0 (5 - 5) n1		
Talstar Flowable Insecticide/Miticide (Bifenthrin)				
Talus 40SC (Buprofezin)	4.0 (4 - 4) n1 <i>Labeled</i>	4.3 (3 - 5) n4 <i>Labeled</i>	3.0 (3 - 3) n1 <i>Labeled</i>	1.0 (1 - 1) n1 <i>Labeled</i>
Talus 70DF (Buprofezin)		4.0 (1 - 5) n6 <i>Labeled</i>		5.0 (5 - 5) n1
Talus WP (Buprofezin)		5.0 (5 - 5) n1 <i>Labeled</i>		
Triact (Clarified hydrophobic extract of neem oil)		4.0 (4 - 4) n1 <i>Labeled</i>		
TriStar 30SG (Acetamiprid)		2.6 (1 - 5) n8 <i>Labeled</i>	3.0 (3 - 3) n1 <i>Labeled</i>	1.0 (1 - 1) n1 <i>Labeled</i>
TriStar 70WSP (Acetamiprid)	4.0 (4 - 4) n1 <i>Labeled</i>			1.0 (1 - 1) n1 <i>Labeled</i>
Xxpire (GF-2860) 40WG (Spinetoram + sulfoxaflor)		3.5 (2 - 5) n2		5.0 (5 - 5) n1

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Product (Active Ingredients)	Fletcher scale ( <i>Parthenolecanium fletcheri</i> )	Florida Red Scale ( <i>Chrysomphalus aonidum</i> )	Florida Wax Scale ( <i>Ceroplastes floridensis</i> )	Gloomy Scale ( <i>Melanaspis tenebricosa</i> )
A16901B 45WG (Cyantraniliprole + thiamethoxam)				<b>5.0 (5 - 5) n1</b>
Acephate Pro 75 WSP (Acephate)				
Aloft SC (Clothianadin + bifenthrin)				
Arena 50WDG (Clothianadin)			<b>5.0 (5 - 5) n1</b>	
AzaGuard (Azadirachtin)				
Botanigard 22WP ( <i>Beauveria bassiana</i> GHA)				
Celero 16WSG (Clothianidin)		<i>1.0 (1 - 1) n1</i>	3.7 (3 - 5) n3 Labeled	
Cygon 2E (Dimethoate)				
Diazinon 4E (Diazinon)				
Discus (Imidacloprid + cyfluthrin)	3.0 (3 - 3) n2 Labeled			
Distance (Pyriproxyfen)	<i>1.0 (1 - 1) n1</i> Labeled		4.0 (4 - 4) n1 Labeled	5.0 (5 - 5) n1 Labeled
Flagship 0.22G (Thiamethoxam)				<b>5.0 (5 - 5) n1</b>
Flagship 25WG (Thiamethoxam)	3.5 (3 - 4) n2 Labeled	<i>1.0 (1 - 1) n1</i>	3.8 (3 - 5) n5 Labeled	<b>5.0 (5 - 5) n1</b>
GF-2626 1SC (Sulfoxafloz)				
Horticultural Oil (Horticultural Oil)				
Judo 2SC (Spiromesifen)				
Kontos (BYI 8330 240SC) (Spirotetramat)				5.0 (5 - 5) n1 Labeled
Mainspring (A20520A) 200SC (Cyantraniliprole)				
Marathon II (Imidacloprid)			5.0 (5 - 5) n1 Labeled	
MOI 201 (MOI 201)				
Onyx (Bifenthrin)				
Orthene TTO 97 (Valent) (Acephate)		<i>1.0 (1 - 1) n1</i> Labeled	<i>1.0 (1 - 1) n2</i> Labeled	
QRD 452 (Extract of <i>Chenopodium ambrosioides</i> )				
Rycar (SP3009/NNI-0101) (Pyrifluquinazon)				<b>5.0 (5 - 5) n1</b>
Safari 20SG (Dinotefuran)	<i>2.0 (2 - 2) n2</i> Labeled	<i>1.0 (1 - 1) n2</i> Labeled	5.0 (5 - 5) n1 Labeled	5.0 (5 - 5) n1 Labeled
Safari 2G (V-10112 2G) (Dinotefuran)				5.0 (5 - 5) n1 Labeled



<b>Product (Active Ingredients)</b>	<b>Fletcher scale (<i>Parthenolecanium fletcheri</i>)</b>	<b>Florida Red Scale (<i>Chrysomphalus aonidum</i>)</b>	<b>Florida Wax Scale (<i>Ceroplastes floridensis</i>)</b>	<b>Gloomy Scale (<i>Melanaspis tenebricosa</i>)</b>
SuffOil X (Synergy) (Petroleum Oil)				
Sun Spray Ultra-Fine Spray Oil (Paraffinic oil)				
Talstar Flowable Insecticide/Miticide (Bifenthrin)				
Talus 40SC (Buprofezin)	2.0 (1 - 3) n2 Labeled		3.0 (2 - 4) n2 Labeled	
Talus 70DF (Buprofezin)				5.0 (5 - 5) n1 Labeled
Talus WP (Buprofezin)	3.0 (3 - 3) n1 Labeled			
Triact (Clarified hydrophobic extract of neem oil)				
TriStar 30SG (Acetamiprid)		1.0 (1 - 1) n1 Labeled	5.0 (5 - 5) n1 Labeled	5.0 (5 - 5) n1 Labeled
TriStar 70WSP (Acetamiprid)	3.0 (3 - 3) n1 Labeled		5.0 (5 - 5) n3 Labeled	
Xxpire (GF-2860) 40WG (Spinetoram + sulfoxaflor)				

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<b>Product (Active Ingredients)</b>	<b>Holly Pit Scale (<i>Asterolecanium puteanum</i>)</b>	<b>Indian Wax Scale (<i>Ceroplastes ceriferus</i>)</b>	<b>Magnolia Scale (<i>Neolecanium cornuparvum</i>)</b>	<b>Oystershell Scale (<i>Diaspidiotus ostreiformis</i>)</b>
A16901B 45WG (Cyantraniliprole + thiamethoxam)			4.0 (4 - 4) n1	
Acephate Pro 75 WSP (Acephate)				
Aloft SC (Clothianadin + bifenthrin)	1.0 (1 - 1) n1			1.0 (1 - 1) n1
Arena 50WDG (Clothianadin)				
AzaGuard (Azadirachtin)				
Botanigard 22WP ( <i>Beauveria bassiana</i> GHA)				
Celero 16WSG (Clothianidin)				
Cygon 2E (Dimethoate)		1.0 (1 - 1) n1		
Diazinon 4E (Diazinon)				
Discus (Imidacloprid + cyfluthrin)				
Distance (Pyriproxyfen)	1.0 (1 - 1) n1 Labeled		5.0 (5 - 5) n1 Labeled	
Flagship 0.22G (Thiamethoxam)			5.0 (5 - 5) n1	
Flagship 25WG (Thiamethoxam)	1.0 (1 - 1) n1			1.0 (1 - 1) n2

Product (Active Ingredients)	Holly Pit Scale ( <i>Asterolecanium puteanum</i> )	Indian Wax Scale ( <i>Ceroplastes ceriferus</i> )	Magnolia Scale ( <i>Neolecanium cornuparvum</i> )	Oystershell Scale ( <i>Diaspidiotus ostreiformis</i> )
GF-2626 1SC (Sulfoxaflor)			5.0 (5 - 5) n1	
Horticultural Oil (Horticultural Oil)				
Judo 2SC (Spiromesifen)				
Kontos (BYI 8330 240SC) (Spirotetramat)				
Mainspring (A20520A) 200SC (Cyantraniliprole)				
Marathon II (Imidacloprid)				
MOI 201 (MOI 201)				1.0 (1 - 1) n1
Onyx (Bifenthrin)				
Orthene TTO 97 (Valent) (Acephate)	1.0 (1 - 1) n1 Labeled			1.0 (1 - 1) n2 Labeled
QRD 452 (Extract of <i>Chenopodium ambrosioides</i> )				
Rycar (SP3009/NNI-0101) (Pyrifluquinazon)	1.0 (1 - 1) n1			
Safari 20SG (Dinotefuran)	1.0 (1 - 1) n1 Labeled			2.8 (1 - 5) n5 Labeled
Safari 2G (V-10112 2G) (Dinotefuran)	1.0 (1 - 1) n1 Labeled			
SuffOil X (Synergy) (Petroleum Oil)				
Sun Spray Ultra-Fine Spray Oil (Paraffinic oil)				
Talstar Flowable Insecticide/Miticide (Bifenthrin)				
Talus 40SC (Buprofezin)	1.0 (1 - 1) n1 Labeled			5.0 (5 - 5) n2 Labeled
Talus 70DF (Buprofezin)			3.0 (3 - 3) n1 Labeled	
Talus WP (Buprofezin)				
Triact (Clarified hydrophobic extract of neem oil)				
TriStar 30SG (Acetamiprid)	1.0 (1 - 1) n1 Labeled			1.0 (1 - 1) n1 Labeled
TriStar 70WSP (Acetamiprid)				2.0 (1 - 3) n2 Labeled
Xxpire (GF-2860) 40WG (Spinetoram + sulfoxaflor)			5.0 (5 - 5) n1 Labeled	

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Product (Active Ingredients)	Pine Needle Scale ( <i>Phenacaspis pinifoliae</i> )	Tea Scale ( <i>Fiorinia theae</i> )	Wax Myrtle Scale ( <i>Melanaspis deklei</i> )	Winged Euonymus Scale ( <i>Lepidosaphes yanagicola</i> )
A16901B 45WG (Cyantraniliprole + thiamethoxam)	1.0 (1 - 1) n2			
Acephate Pro 75 WSP (Acephate)				
Aloft SC (Clothianadin + bifenthrin)	5.0 (5 - 5) n1 Labeled			
Arena 50WDG (Clothianadin)				
AzaGuard (Azadirachtin)		3.0 (3 - 3) n1		
Botanigard 22WP (Beauveria bassiana GHA)				
Celero 16WSG (Clothianidin)				
Cygon 2E (Dimethoate)				
Diazinon 4E (Diazinon)				
Discus (Imidacloprid + cyfluthrin)				
Distance (Pyriproxyfen)	5.0 (5 - 5) n1 Labeled	3.5 (2 - 5) n2	2.0 (1 - 3) n2 Labeled	2.0 (2 - 2) n1 Labeled
Flagship 0.22G (Thiamethoxam)	1.0 (1 - 1) n3			
Flagship 25WG (Thiamethoxam)	2.0 (1 - 3) n2			3.0 (3 - 3) n2
GF-2626 1SC (Sulfoxaflor)	2.0 (2 - 2) n1			
Horticultural Oil (Horticultural Oil)				
Judo 2SC (Spiromesifen)				
Kontos (BYI 8330 240SC) (Spirotetramat)	4.0 (3 - 5) n2 Labeled	5.0 (5 - 5) n1 Labeled		2.0 (2 - 2) n1 Labeled
Mainspring (A20520A) 200SC (Cyantraniliprole)		3.0 (3 - 3) n2		
Marathon II (Imidacloprid)				
MOI 201 (MOI 201)				
Onyx (Bifenthrin)				
Orthene TTO 97 (Valent) (Acephate)				
QRD 452 (Extract of <i>Chenopodium ambrosioides</i> )				
Rycar (SP3009/NNI-0101) (Pyrifluquinazon)	4.5 (4 - 5) n2			
Safari 20SG (Dinotefuran)	4.0 (2 - 5) n3 Labeled	4.5 (3 - 5) n4 Labeled	3.0 (3 - 3) n2 Labeled	1.0 (1 - 1) n3 Labeled
Safari 2G (V-10112 2G) (Dinotefuran)	2.0 (1 - 3) n2 Labeled	3.0 (1 - 5) n3 Labeled		
SuffOil X (Synergy) (Petroleum Oil)		4.0 (3 - 5) n2		
Sun Spray Ultra-Fine Spray Oil (Paraffinic oil)	5.0 (5 - 5) n1		3.0 (3 - 3) n1	

Product (Active Ingredients)	Pine Needle Scale ( <i>Phenacaspis pinifoliae</i> )	Tea Scale ( <i>Fiorinia theae</i> )	Wax Myrtle Scale ( <i>Melanaspis deklei</i> )	Winged Euonymus Scale ( <i>Lepidosaphes yanagicola</i> )
Talstar Flowable Insecticide/Miticide (Bifenthrin)				
Talus 40SC (Buprofezin)		<b>4.0 (4 - 4) n1</b>	3.0 (3 - 3) n2 Labeled	5.0 (5 - 5) n2 Labeled
Talus 70DF (Buprofezin)	5.0 (5 - 5) n2 Labeled	3.5 (2 - 5) n2 Labeled		
Talus WP (Buprofezin)				
Triact (Clarified hydrophobic extract of neem oil)		<b>1.0 (1 - 1) n1</b> <i>Labeled</i>		
TriStar 30SG (Acetamiprid)	5.0 (5 - 5) n2 Labeled			
TriStar 70WSP (Acetamiprid)				<b>2.5 (2 - 3) n2</b> <i>Labeled</i>
Xxpire (GF-2860) 40WG (Spinetoram + sulfoxaflor)	3.0 (3 - 3) n2 Labeled	5.0 (5 - 5) n1 Labeled		

Foliar Applied Insecticides (active ingredients)	IRAC Class	Registered Use Site(s)	Knock Down	Residual Control (days)	REI	Scale-Mealybug Efficacy				Life Stages			Treatment Program			
						Armored Scales	Cushion Scales	Soft Scales	Mealybugs	Immatures	Pupae	Adults	A	B	C	D
													Aggressive	Maintenance w/out biologicals	Maintenance with Biologicals	Maintenance prior to biologicals
Aria (flonicamid)	9c	G, I, N	M	7-14	12 h	?	?	?	G-E	x	?	x	?	B	C	D
Astro, Permethrin.Pro, etc. (permethrin)	3A	G, I	F	5-7	12 h	?	?	?	?	x	?	x	?	B	NO	NO
Aza-Direct, Molt-X, etc. (azadirachtin)	18B	G, I, N, S	S	7	4 h	?	?	?	?	x	?	?	?	?	C	D
BotaniGard, Mycotrol-O, Naturalis L ( <i>Beauveria bassiana</i> )	M	G, I, N, S	M	3	4 h	P	?	?	?	x	x	x	?	B	C *	D
Conserve SC, Entrust (spinosad)	5	G, L, N, S	F	5	4 h	?	?	?	?	x	?	x	A	B	C **	D
Decathlon (cyfluthrin)	3A	G, I, N	F	7	12 h	?	?	?	?	x	?	x	?	B	NO	NO
Cygon, Dimethoate (dimethoate)	1B	N	F	5-7?	48 h	G	?	?	?	x	?	x	?	B	NO	NO
Discus Tablet (cyfluthrin+imidacloprid)	3A + 4A	N	F	5-7	12 h	?	?	G	?	x	?	x	?	B	NO	NO
Distance (pyriproxyfen)	7D	G, I, L, S	S	?	12 h	P-E	P-E	P-F	P-E	x	x	?	?	B	NO	NO
Duraguard, Dursban (chlorpyrifos)	1B	G, N	F	5-7	24 h	F	?	P	?	x	?	x	?	B	NO	NO
Ecotec, Ecotrol (rosemary and peppermint oils)	-	G, N	?	?	?	?	?	?	?	x	?	x	?	?	?	?
Enstar AQ (kinoprene)	7A	G, I, L, S	S	?	4 h	?	?	?	?	x	?	x	?	?	C	D
Flagship 25WG (thiamethoxam)	4A	G, I, L, N, S	F	7-14	12 h	P-E	P-G	F-E	E	x	?	x	A	B	?	?
Grandevo, MBI-203 DF ( <i>Chromobacterium subsugae</i> strain PRAA4-1 <sup>T</sup> )	-	G, N	S	?	4 h	?	?	?	P-G	x	?	x	?	?	?	?
Hachi-Hachi EC (tolfenpyrad)	21A	G	F	7-14	12 h	?	?	?	G	x	?	x	A	B	NO	?
Judo (spiromesifen)	23	G, N, S	M	7	12 h	?	?	?	?	x	?	x	A	B	?	?
Kontos, BYI-8330 (spirotetramat)	23	G, I, N	S	7-14	24 h	P-E	P-E	E	G-E	x	?	x	A	B	?	?
Mainspring, A20520A, DPX-HGW86 (cyantraniliprole)	28	G, I	F	?	4 h	P-E	?	E	?	?	?	?	?	B	?	?
Malathion	1B	G, N	F	5-7	12 h	?	?	?	?	x	?	x	?	B	NO	NO
Marathon (imidacloprid)	4A	G, I, N	F	?	12 h	?	?	?	?	x	?	x	?	B	NO	NO
Mavrik (fluvalinate)	3	G, I, N	F	14	12 h	?	?	?	?	x	?	x	?	B	NO	NO
Met 52, Tick Ex ( <i>Metarhizium anisopliae</i> F52)	-	G, N	M	5-7	4 h	?	E	?	?	x	?	x	?	?	?	?
M-Pede, Safer Soap (potassium salts of fatty acids)	-	G, I, N	F	Contact	12 h	?	?	?	?	x	?	?	A	B	C **	D
NoFly WP ( <i>Paecilomyces fumosoroseus</i> strain FE 9901)	-	G	M	3-7	4 h	P - G	P - G	P - G	P - G	x	?	x	A	B	C	D
Orthene T&O, Acephate 97 UP (acephate)	1B	G, N	F	7	24 h	P-E	F-G	P-G	E	x	?	x	A	B	NO	NO
Preferal, PFR-97 ( <i>Isaria fumosoroseus</i> )	-	G, L, N, S	S	Contact	4 h	?	?	?	?	x	?	x	A	B	C	D
Prentox Pyronyl Crop Spray, Pyrenone Crop Spray, etc. (pyrethrins + PBO)	3A + -	G, N	F	Contact	12 h	?	?	?	?	x	?	x	?	B	NO	NO

Foliar Applied Insecticides (active ingredients)	IRAC Class	Registered Use Site(s)	Knock Down	Residual Control (days)	REI	Scale-Mealybug Efficacy				Life Stages			Treatment Program			
						Armored Scales	Cushion Scales	Soft Scales	Mealybugs	Immatures	Pupae	Adults	A	B	C	D
													Aggressive	Maintenance w/out biologicals	Maintenance with Biologicals	Maintenance prior to biologicals
Rycar, NNI-0101 (pyrifluquinazon)	UN	G	?	10	12 h	P-E	E	?	G-E	x	?	x	?	B	?	?
Safari 20SG (dinotefuran)	4A	G, N	M	7	12 h	P-E	P	P-E	F-E	x	?	x	A	B	NO	NO
Scimitar GC (lambda-cyhalothrin)	3A	G, N, S	F	7	24 h	?	?	?	?	x	?	x	?	B	NO	NO
Sorbishield 90 (sorbitol octanoate)	-	G, N	?	Contact	24 h	?	?	?	?	x	?	x	?	B	?	?
Sucrashield (sucrose octanoate)	-	G, N	?	Contact	48 h	?	?	?	?	x	?	x	?	B	?	?
Supracide (methidathion)	1B	N	F	?	48 h	?	?	?	?	x	?	x	?	B	NO	NO
Surround WP (kaolin)	-	G	?	Contact	4 h	?	?	?	?	x	?	x	?	B	C	D
Talstar, Onyx (bifenthrin)	3A	G, I, N	F	7	12 h	P-E	?	P	G	x	?	x	?	B	NO	NO
Talus (buprofezin)	16	G, L, N, S	S	14	12 h	P-E	P-E	P-G	F-E	x	?	x	A	B	C	D
Tame (fenpropathrin)	3A	G, I, L, N, S	F	7	24 h	?	?	?	?	x	?	x	?	B	NO	NO
Triact, Trilogy Neem Oil (extract of neem oil)	18B	G, N	S	7	4 h	G	?	?	?	x	?	?	?	?	C	D
TriStar (acetamiprid)	4A	G, L, N, S	F	?	12 h	P-E	G-E	G-E	G-E	x	?	x	A	B	NO	D
Ultra pure oil, SuffOil-X, etc. (paraffinic oil)	-	G, N	F	Contact	4 h	P-E	P-E	?	E	x	x	x	A	B	C**	D
XXpire (spinetoram+sulfoxaflor)	5+4C	G, N	F	14	12 h	F-E	P-E	P-G	?	x	?	?	?	B	?	?
Experimental Products																
A16901B (cyantraniliprole + thiamethoxam)	28 + 4A	TBD	?	?	?	E	P	P	E	x	?	x	?	?	?	?
Aloft (bifenthrin + clothianidin)	3A + 4A	TBD	F	?	12 h	P-G	?	?	?	x	?	x	?	?	?	?
Arena, Celero 16WG (clothianidin)	4A	TBD	?	?	12 h	P-E	P	F-E	?	x	?	x	?	?	NO	NO
BAS 440	-	TBD	?	?	?	?	?	?	?	?	?	?	?	?	?	?
BYI-2960	-	TBD	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Facin ( <i>Chenopodium ambrosioides</i> )	-	TBD	?	?	?	?	?	?	F-G	x	?	x	?	?	?	?
GF-2626 1SC (sulfoxaflor)	-	TBD	?	?	?	F-E	P-G	?	?	x	?	x	?	?	?	?
IKI-3106	-	TBD	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Venerate, MBI-206 ( <i>Burkholderia</i> sp. strain A396)	-	G, N	S	?	4h	?	?	?	E	x	?	x	?	?	?	?
Milstop <sup>a</sup> (potassium bicarbonate)	NC	G, I, L, N, S	?	?	1 h	?	?	?	G	x	?	?	?	?	?	?
QRD 416 (oil extract from <i>Chenopodium</i> sp.) <sup>b</sup>	-	TBD	?	?	?	?	?	?	?	x	?	x	?	?	?	?

Registered Use Sites: G = Greenhouse; L = Lath House; I = Indoors; N = Nursery; S = Shade House; TBD = To Be Determined

Knockdown: Fast (< 1 day), Medium (1-7 days), Slow (>7 days).

Efficacy: P = Poor (< 70% control); F = Fair (70% to 85% control); G = Good (85% to 95% control), E = Excellent (>95% control) on immatures and/or adults 1 to 3 weeks after first app.

Residual Control taken from product technical and label info, recommendations on earliest application intervals; Scale, Mealybug Efficacy taken from latest IR-4 efficacy summary draft; Effect on biological control agents for scales/mealybugs taken from Koppert, Biobest and some extension publications/recommendations.

Information presented is based on the best data available on July 17, 2015.



## Registered and Experimental Products for Scale & Mealybug Management

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Armored scales: *Aspidiotus cryptomeriae*, *Aterolecanium puteanum*, *Chrysomphalus aonidum*, *Chrysomphalus bifasciculatus*, *Fiorinia externa*, *Fiorinia theae*, *Lepidosaphes camelliae*, *Lepidosaphes ulmi*, *Lepidosaphes yanagicola*, *Melanaspis deklei*, *Phenacaspis pinifoliae*, *Pseudaulacaspis cockerelli* and *Unaspis euonymi*

Cushion scales: *Icerya purchasi*,

Soft scales: *Ceroplastes floridensis*, *Eulecanium cerasorum*, *Lecanium fletcheri* and *Pulvinaria innumerabilis*

Mealybugs: *Balanococcus diminutus*, *Phenacoccus gossypii*, *Phenacoccus madeirensis*, *Planococcus citri* and *Rhizoecus hibisci*

\* Results of efficacy trials have been variable for entomopathogens and impact on beneficial organisms is presumed to be less than that of traditional pesticide chemistries but the data are sparse.

\*\* This insecticide is toxic to many BCA's but has a short residual and may be suitable for treating hot spots and re-introducing BCA's soon thereafter.

<sup>a</sup> Milstop has a New York 2ee recommendation to control mealybugs, aphids, spider mites, stink bugs and whiteflies.

<sup>b</sup> No longer sold or produced. To be replaced by QRD 4.052. New formulation in early development stage, no testing before 2015.