



# Environmental Horticulture Program Research Project Sheet

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

**Project Name:** Thrips Efficacy

<b>New</b>	<b>Ongoing</b>	X	<b>Completed</b>	<b>Duration if ongoing or completed:</b>	2006 - 2021
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**Project Description:**

Thrips species can be highly destructive from their own feeding on delicate plant parts and the viruses they vector. Western flower thrips (WFT) can be difficult to manage because it tends to feed on flower petals and often hides deep within flower heads, masked by the petals. Good coverage is key to optimal management as is a good rotational program among different IRAC mode of action classes to reduce resistance development. This project arose from the concern of limited tools (Mesurol, Conserve) with known resistant WFT populations as a way to identify new tools to enable growers to effectively manage these pests.

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

For the last 14 years, the IR-4 Environmental Horticulture Workshop has ranked developing efficacy data on new products to manage thrips as a High Priority Project either nationally or regionally. Thrips remain an important threat for several reasons: 1) the damage thrips cause to environmental horticulture plants, decreasing the value of the infested crops; 2) the tospoviruses (tomato spotted wilt, impatiens necrotic ringspot) they can vector; 3) the newly arrived invasive species which impact at least 250 different environmental horticulture species; and 4) growers lack the ability to rotate among 3 to 4 different modes of actions to effectively manage resistance development in the thrips populations they must control to maintain economic viability. From 2005 through 2019, 89 products representing 59 different active ingredients were tested for thrips management. These products represented both biological and chemical tools. Some products were already registered, but more data were needed particularly with the newly invasive thrips species or they were considered standards to measure the level of efficacy achieved with other materials. Other products were in development but have not yet been registered with the EPA. The five thrips species tested in the IR-4 program were Chilli Thrips (*Scirtothrips dorsalis*), Gladiolus Thrips (*Thrips simplex*), Privet Thrips (*Dendothrips ornatus*), Weeping Fig Thrips (*Gynaikothrips uzeli*), and Western Flower Thrips (*Frankliniella occidentalis*).

**Target Species (Phytotoxicity, or common and Latin name of arthropod, pathogen, weed):**

- Chilli Thrips (*Scirtothrips dorsalis*)
- Cuban Laurel Thrips (*Gynaikothrips ficorum*)
- Gladiolus Thrips (*Thrips simplex*)
- Orchid Thrips (*Chaetanaphothrips orchidii*)
- Privet Thrips (*Dendothrips ornatus*)
- Weeping Fig Thrips (*Gynaikothrips uzeli*)
- Western Flower Thrips (*Frankliniella occidentalis*)

**Target Crops (list tested crops if ongoing or completed project)**

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>African Marigold (<i>Tagetes erecta</i>)</li> <li>Butterfly Bush (<i>Buddleia davidii</i>)</li> <li>Cosmos (<i>Cosmos sp.</i>)</li> <li>Flamingo-lily (<i>Anthurium andraeanum</i>)</li> <li>Geranium (<i>Pelargonium sp.</i>)</li> <li>Gladiolus (<i>Gladiolus sp.</i>)</li> <li>Hardy mum (<i>Chrysanthemum x morifolium</i>)</li> <li>Marigold (<i>Tagetes sp.</i>)</li> <li>New Guinea Impatiens (<i>Impatiens hawkeri</i>)</li> </ul> | <ul style="list-style-type: none"> <li>New Mexican Privet (<i>Forestiera neomexicana</i>)</li> <li>Petunia (<i>Petunia sp.</i>)</li> <li>Purslane (<i>Portulaca sp.</i>)</li> <li>Rose (<i>Rosa sp.</i>)</li> <li>Transvaal Daisy (<i>Gerbera sp.</i>)</li> <li>Vervain (<i>Verbena sp.</i>)</li> <li>Weeping Fig (<i>Ficus benjamina</i>)</li> <li>Zinnia (<i>Zinnia sp.</i>)</li> </ul> |
|---|---|

Target Product(s)(list tested products or numbered compounds if ongoing or completed project)				
A16901B	Carzol	Grandevo	Orthene TTO	Scimitar CS
Acelepryn	Celero 16WSG	Hachi-Hachi	Overture 35WP	Sevin SL
Allectus SC	Conserve SC	Kontos	Pedestal	Surround WP
Aloft SC	Cyclaniliprole	Mainspring	Proud 3	Talstar NF
Aria 50SG	Diazinon 50W	Marathon 1G	Pylon	Tempo Ultra
Avid 0.15EC	Dimethoate 4EC	Marathon II	QRD 400	TickEx EC
AzaGuard	Discus	Marathon Ultra	QRD 416	TriCon (BW420)
BAS 320i	DPX-HGW86	MesuroI 75W	S1812 35WP	TriStar 30SG
BotaniGard 22WP	Dursban 50W	Met52	Safari 20SG	Venerate
BotaniGard ES	EcoTrol	MilStop	Safari 2G	XXpire
Capsil	Flagship 25WG	MOI201	Safer Soap	
		OHP 929-2		

Product Registration and Research Status			
	Fully Screened (also includes standards)	Partially Screened through IR-4 <sup>1</sup>	Need Data for AdditionalSpecies?
Labeled for Thrips Generally & Commercialized	<b>Conserve SC *</b> Flagship 25WG Marathon II Marathon Ultra <b>Orthene TTO *</b> Pedestal	<b>Pylon *</b> <b>Safari 20SG *</b> Scimitar CS Talstar NF Tempo Ultra TriStar 30SG	Allectus SC <sup>2</sup> Aloft SC <sup>2</sup> Discus EcoTrol Marathon 1G Met52 Safari 2G SaferSoap Surround WP
Labeled for Thrips Generally But NOT Commercialized			
Labeled for Specific Thrips & Commercialized		BotaniGard 22WP BotaniGard ES <b>Rycar (NNI-0101)</b>	BotaniGard MAXX Xpectro OD
Labeled for Specific Thrips but NOT Commercialized			
Not yet registered or labeled for thrips		A16901B Venerate (MBI 206 F)	MilStop OHP 929-2
No longer available for development for thrips	Carzol Diazinon 50W Dimethoate 4EC DPX-HGW86 Dursban 50W MesuroI 75W	MOI 201 QRD 400 QRD 416 Sevin SL TriCon (BW420)	<b>Acelepryn *</b> <b>BAS 320i</b> Celero 16WSG <sup>2</sup> <b>Kontos *</b> S1812 35WP

\* 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

**Other:**

This project also tested tank mix and rotations to foster IPM strategies for managing resistance. Two other projects were offshoots from this one: Thrips Materials Crop Safety and Screening of Impacts on Thrips Beneficial Organisms

Area	Characteristic	Pro	Con
Availability & effectiveness of alternative management tools	Thrips remain a hard to manage pest	X	
	Several IRAC classes are available for resistance management		X
	Very few materials for outdoor uses on WFT	X	
	Very few new tools and new classes for screening		X
Damage potential of target			
Performance and crop safety of proposed products (from other systems)	A lot of data available already for WFT		X
	Need data on various thrips species other than WFT	X	
Compatibility with IPM, resistance management programs	Insecticide resistance in greenhouse thrips populations is common; hence, resistance management is essential	X	
Economics			
Geographic distribution			
Manufacturer interest in labeling products	Three + unregistered tools to screen	X	
Other	Some growers not utilizing effective resistance management strategies therefore resistant thrips spreading (not necessarily a specific project con)		X
	Successful project for registrations	X	
2017 comments: Need products that can be used outdoors (indoor testing though to avoid beneficials), WFT, Chili, Red banded			

### 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 disease 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/disease combinations (3 or more trials) with an average rating of 3 or higher are highlighted with *green text*. For disease/product combinations that are blank, IR-4 has not screened this combination.

MOA	Products (Active Ingredients)	Chilli Thrips, Yellow Tea Thrips ( <i>Scirtothrips dorsalis</i> )	Gladiolus Thrips ( <i>Thrips simplex</i> )	<i>Gynaikothrips uzeli</i>	Orchid Thrips ( <i>Chaetanaphothrips orchidii</i> )	Privet Thrips ( <i>Dendrothrips ornatus</i> )	Western Flower Thrips ( <i>Frankliniella occidentalis</i> )
IRAC 1A	Carzol SP (Formetanate hydrochloride)		4.0 (4 - 4) n1				
	Mesurool 75-W (Methicarb)		4.0 (4 - 4) n1 Labeled				2.6 (1 - 5) n5 Labeled
	Sevin SL (Carbaryl)			1.0 (1 - 1) n1			
IRAC 1B	Diazinon 50W (Diazinon)		5.0 (5 - 5) n1				
	Dimethoate 4EC (Drexel) (Dimethoate)				4.0 (3 - 5) n2 Labeled		
	Dursban 50 W (Chlorpyrifos)			1.0 (1 - 1) n1			
	Orthene TTO 97 (Valent) (Acephate)		5.0 (5 - 5) n1 Labeled	2.0 (2 - 2) n1 Labeled			
IRAC 2B	BAS 350i (Fipronil)						5.0 (5 - 5) n1
IRAC 3 + IRAC 4	Allectus SC (Bifenthrin + Imidacloprid)		5.0 (5 - 5) n1 Labeled	5.0 (5 - 5) n1 Labeled			1.0 (1 - 1) n1 Labeled
IRAC 3A	Scimitar CS (Lambda-cyhalothrin)					4.0 (4 - 4) n1 Labeled	1.0 (1 - 1) n2 Labeled
	Talstar Flowable Insecticide/Miticide (Bifenthrin)		4.0 (4 - 4) n1				
	Talstar NF (Bifenthrin)			4.8 (4 - 5) n4 Labeled			
	Tempo Ultra (Cyfluthrin)			2.0 (2 - 2) n1			
IRAC 3A + IRAC UNF	BotaniGard MAXX (Pyrethrins + Beauveria bassiana Strain GHA)						2.0 (2 - 2) n1
IRAC 4 + IRAC 3A	Discus (Imidacloprid + cyfluthrin)		5.0 (5 - 5) n1 Labeled	2.0 (1 - 3) n2 Labeled			
IRAC 4A	Celero 16WSG (Clothianidin)		4.0 (4 - 4) n1	2.5 (1 - 4) n2			2.3 (1 - 4) n7
	Flagship 25WG (Thiamethoxam)	3.7 (1 - 5) n3 Labeled	5.0 (5 - 5) n1 Labeled	2.3 (1 - 3) n3 Labeled		2.0 (2 - 2) n1 Labeled	2.3 (1 - 5) n20 Labeled
	Marathon 1% granular (Imidacloprid)			1.0 (1 - 1) n1 Labeled			
	Marathon II (Imidacloprid)		4.0 (4 - 4) n1				
	Safari 20SG (Dinotefuran)	4.0 (4 - 4) n2 Labeled	5.0 (5 - 5) n1 Labeled	2.5 (1 - 4) n2 Labeled			2.5 (1 - 3) n4 Labeled
	Safari 2G (Dinotefuran)	3.0 (3 - 3) n1					

MOA	Products (Active Ingredients)	Chilli Thrips, Yellow Tea Thrips ( <i>Scirtothrips dorsalis</i> )	Gladiolus Thrips ( <i>Thrips simplex</i> )	<i>Gynaikothrips uzeli</i>	Orchid Thrips ( <i>Chaetanaphothrips orchidii</i> )	Privet Thrips ( <i>Dendrothrips ornatus</i> )	Western Flower Thrips ( <i>Frankliniella occidentalis</i> )
IRAC 4A	TriStar 30SG (Acetamiprid)	4.0 (3 - 5) n2 Labeled	5.0 (5 - 5) n1 Labeled				2.4 (1 - 5) n5 Labeled
IRAC 4A + IRAC 28	A16901B 45WG (Thiamethoxam + cyantraniliprole)						3.6 (1 - 5) n7 Labeled
IRAC 4A + IRAC 3	Aloft SC (Clothianadin + bifenthrin)	<b>3.0 (3 - 3) n1</b>					
IRAC 4A + IRAC 3A	Marathon Ultra (Imidacloprid + cyfluthrin)	4.0 (3 - 5) n2 Labeled					1.0 (1 - 1) n1 Labeled
IRAC 4D	Altus (Flupyradifurone)						1.0 (1 - 1) n1
IRAC 5	Conserve SC (Spinosad)	3.0 (1 - 4) n4 Labeled	4.0 (4 - 4) n1 Labeled	1.0 (1 - 1) n1 Labeled		3.0 (3 - 3) n1 Labeled	2.8 (1 - 5) n33 Labeled
IRAC 5 / IRAC 21 / IRAC 13	Rotation: Conserve / Tolfenpyrad / Pylon (Spinosad / tolfenpyrad / chlorfenapyr)						5.0 (5 - 5) n1
IRAC 5 + IRAC 4C	Xxpire 40WG (Spinetoram + sulfoxaflor)						3.5 (2 - 5) n6 Labeled
IRAC 6	Avid 0.15EC (Abamectin)	4.0 (4 - 4) n1 Labeled	4.0 (4 - 4) n1 Labeled	1.0 (1 - 1) n1 Labeled			3.1 (1 - 5) n13 Labeled
IRAC 9B	Rycar (Pyrifluquinazon)		<b>3.0 (3 - 3) n1</b>			<b>3.0 (3 - 3) n1</b>	1.7 (1 - 5) n16
IRAC 13	Pylon (Chlorfenapyr)	5.0 (5 - 5) n1 Labeled	4.0 (4 - 4) n1 Labeled				3.6 (1 - 5) n16 Labeled
IRAC 15	Pedestal (Novaluron)		5.0 (5 - 5) n1 Labeled				
IRAC 21A	Hachi-Hachi EC (Tolfenpyrad)	3.0 (3 - 3) n1 Labeled	4.0 (4 - 4) n1 Labeled			3.0 (3 - 3) n1 Labeled	3.3 (1 - 5) n22 Labeled
	Hachi-Hachi SC (Tolfenpyrad)						5.0 (5 - 5) n1
IRAC 22B	BAS 320i (Metaflumizone)						1.3 (1 - 2) n4
IRAC 23	Kontos (BYI 8330 240SC) (Spirotetramat)	1.0 (1 - 1) n3 Labeled	5.0 (5 - 5) n1 Labeled	1.0 (1 - 1) n1 Labeled		2.0 (2 - 2) n1 Labeled	2.3 (1 - 5) n20 Labeled
IRAC 28	Acelepryn (Dupont) (Chlorantraniliprole)			1.0 (1 - 1) n1			1.8 (1 - 4) n10
	DPX-HGW86 (Cyantraniliprole)						3.7 (2 - 5) n3 Labeled

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IRAC 28	Mainspring GNL 200SC (Cyantraniliprole)						4.0 (3 - 5) n9 Labeled
	Sarisa 50SL (Cyclaniliprole)	1.0 (1 - 1) n1 Labeled					3.1 (1 - 5) n12 Labeled
IRAC 28 / FRAC NC & IRAC UNB	Rotation: IKI-3106 / Venerate XC (Cyclaniliprole / Burkholderia sp. strain A 396)	1.0 (1 - 1) n1					2.2 (1 - 5) n6
IRAC 28 +	Tank Mix: A16901B + CA4803A (A169091B + CA4803A)						5.0 (5 - 5) n2
IRAC 28 + IRAC 29	Pradia (Cyclaniliprole + Flonicamid)						3.7 (1 - 5) n3
IRAC 29	Aria 50SG (Flonicamid)	4.0 (4 - 4) n2 Labeled	2.0 (2 - 2) n1 Labeled	1.0 (1 - 1) n1 Labeled			2.4 (1 - 5) n8 Labeled
IRAC 29 / UNF	Rotation: Aria / TickEx (Flonicamid + Metarhizium anisopliae)						2.0 (2 - 2) n1
IRAC 29 / IRAC 21 / IRAC 13	Rotation: Aria / Tolfenpyrad / Pylon (Flonicamid / tolfenpyrad / chlorfenapyr)						3.0 (1 - 5) n2
IRAC 29 / IRAC UNF	Rotation: Aria / Botanigard (Flonicamid + Beauveria bassiana)						2.0 (2 - 2) n1
IRAC 29 + IRAC UN	Tank Mix: Aria + Rycar (Flonicamid + pyrfluquinazon)						3.3 (1 - 5) n3
FRAC BM01	Proud 3 (Thyme oil (5.6%))						2.1 (1 - 5) n7
FRAC NC	BW133 (BW133)						1.0 (1 - 1) n2
	Grandevo (MBI 203 DF) (Chromobacterium subtsugae NRRL B-30655)						1.4 (1 - 3) n7 Labeled
	MilStop (Potassium bicarbonate)			1.0 (1 - 1) n2			
	MOI 201 (MOI 201)					1.0 (1 - 1) n1	2.4 (1 - 4) n7
FRAC NC & IRAC UNB	Venerate CG (Burkholderia rinojensis strain A396)	1.0 (1 - 1) n1					1.1 (1 - 2) n16

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FRAC NC & IRAC UNF	Met52 (Metarhizium anisopliae strain F52)						1.0 (1 - 1) n2 Labeled
FRAC P07	Safer Soap (Potassium salts of fatty acids)			1.0 (1 - 1) n2 Labeled			
IRAC UN	AzaGuard (Azadirachtin)						2.0 (1 - 3) n8 Labeled
	Azatin XL (Azadirachtin)		3.0 (3 - 3) n1 Labeled	1.0 (1 - 1) n2 Labeled			
	Overture 35WP (Pyridalyl)	3.0 (3 - 3) n1 Labeled	4.0 (4 - 4) n1 Labeled	1.0 (1 - 1) n1 Labeled			3.8 (1 - 5) n13 Labeled
	S1812 35WP VC1638 (Pyridalyl)						3.5 (2 - 5) n4
IRAC UN / IRAC 21	Rotation: NNI-0101 / Tolfenpyrad (NNI-0101 / tolfenpyrad)						1.0 (1 - 1) n1
IRAC UNE	EcoTrol (Rosemary Oil)					1.0 (1 - 1) n1	1.0 (1 - 1) n1
	QRD 400 (Extract of Chenopodium ambrosioides)	1.0 (1 - 1) n1					3.5 (3 - 4) n2
	QRD 416 (Extract of Chenopodium ambrosioides)						1.0 (1 - 1) n2
	TetraCURB Concentrate (Rosemary Oil)						2.5 (1 - 4) n2
	TetraCURB Organic (Rosemary Oil)						1.0 (1 - 1) n2
IRAC UNF	Botanigard 22WP (Beauveria bassiana GHA)						1.0 (1 - 1) n2 Labeled
	BotaniGard ES (BioWorks) (Beauveria bassiana Strain GHA)			1.0 (1 - 1) n1 Labeled			2.7 (1 - 5) n3 Labeled
	BotaniGard ES (Laverlam International) (Beauveria bassiana)						4.0 (3 - 5) n5 Labeled
	Rotation: Botanigard + MoltX / Botanigard (Beauveria bassiana + BW533)						1.6 (1 - 3) n5
	Rotation: Botanigard + SuffOil-X / Botanigard (Beauveria bassiana + paraffin oil)						1.8 (1 - 3) n6

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	Tank Mix: BotaniGard + Tick-Ex (Beauveria bassiana + Metarhizium anisopliae)						1.0 (1 - 1) n3
	Tank Mix: Botanigard 22WP + BW130 (Beauveria bassiana + BW130)						3.0 (3 - 3) n1
	TickEx EC (Metarhizium anisopliae)					3.0 (3 - 3) n1 Labeled	1.6 (1 - 5) n15 Labeled
	Velifer (Beauveria bassiana strain PPRI 5339)						1.0 (1 - 1) n2
IRAC UNF / IRAC 21	Rotation: Tick-Ex / Hachi-Hachi (Metarhizium anisopliae / tolfenpyrad)						3.5 (2 - 5) n2
IRAC UNF / IRAC 21A	Rotation: Botanigard / Hachi-Hachi (Beauveria bassiana / tolfenpyrad)						3.5 (3 - 4) n2
UNM	Surround WP (Kaolin Clay)			4.0 (4 - 4) n1 Labeled			
NA	Amblyseius cucumeris (Amblyseius cucumeris)						5.0 (5 - 5) n1
unknown	BCS-507 (BCS-507)						2.0 (1 - 4) n3
unknown	BW238 ES (BW238 ES)						1.0 (1 - 1) n1
unknown	BW238 WP (BW238 WP)						1.0 (1 - 1) n1
unknown	Capsil (Blend of polyether-and polymethylsiloxane copolymer and nonionic surfactants)			1.0 (1 - 1) n3			
unknown	ISM-555 (ISM-555, A21377X)						5.0 (5 - 5) n3
unknown	KOC22018-8 (Botanical Oil Blend)						4.0 (4 - 4) n1
unknown	MBI 203 SC2 (MBI 203)						1.7 (1 - 3) n3
unknown	MBI 306 (MBI 306)						1.0 (1 - 1) n3
unknown	OHP 929-2 (OHP 929-2)						3.0 (1 - 5) n2
unknown	SP3014 (SP3014)						2.3 (1 - 4) n6
unknown	TriCon (BW 420) (Sodium tetraborahydrate decahydrate)		1.0 (1 - 1) n1	1.0 (1 - 1) n1			3.3 (1 - 5) n6



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unknown	V-10433 (V-10433)						2.5 (1 - 3) n6

IRAC Class	Foliar Applied Insecticides (active ingredients)	Registered Use Site(s)	Knock Down	Residual Control (days)	REI	Thrips Efficacy				Life Stage		
						Western Flower	Chilli	***Gynaikothrips	Gladiolus	Immatures	Pupae	Adults
<b>Registered Products</b>												
1A	Mesurool 75WP (methiocarb)	G, N	F	Contact	24 h	P-E	-	-	F	x	-	x
1B	Dimethoate	N	F	5-7?	48 h	-	-	-	-	x	-	x
	Duraguard, Dursban (chlorpyrifos)	G, N	F	5-7?	24 h	-	-	P	-	x	-	x
	Malathion	G, N	F	5-7?	12 h	-	-	-	-	x	-	x
	Orthene T&O, Acephate 97 UP (acephate)	G, N	F	7	24 h	E	-	P	G	x	-	x
3A	Astro, Permethrin.Pro, etc. (permethrin)	G, I	F	5-7	12 h	-	-	-	-	x	-	x
	Decathlon, Tempo (cyfluthrin)	G, I, N	F	7	12 h	-	-	P	-	x	-	x
	Mavrik (fluvalinate)	G, I, N	F	5-7	12 h	-	-	-	-	x	-	x
	Scimitar GC (lambda-cyhalothrin)	G, N, S	F	7	24 h	P-E	P	-	-	x	-	x
	Talstar (bifenthrin)	G, I, N	F	-	12 h	-	P-F	P-E	-	x	-	x
	Tame (fenpropathrin)	G, I, L, N, S	F	7	24 h	-	-	-	-	x	-	x
3A + ?	Prentox Pyronyl Crop Spray, Pyrenone Crop Spray, etc. (pyrethrins + PBO)	G, N	F	-	12 h	-	-	-	-	x	-	x
3A + 4A	Discus Tablet (cyfluthrin + imidacloprid)	N	F	7	12 h	-	-	E	E	x	-	x
4A	Flagship 25WG (thiamethoxam)	G, L, N, S	F	-	12 h	P-E	E	G	E	x	-	x
	Marathon, Merit (imidacloprid)	G, I, N	F	-	12 h	E	G-E	-	E	x	-	x
	Safari 20SG (dinotefuran)	G, N	M	7	12 h	P-G	P-E	E	G	x	-	x
	TriStar (acetamiprid)	G, L, N, S	F	-	12 h	P-E	E	F	E	x	-	x
4D	Altus (flupyradifurone)	G, N	-	7-10	4 h <sup>a</sup>	P	P	-	-	x	-	x
5	Conserve SC, Entrust (spinosad)	G, L, N, S	F	5	4 h	P-E	P-E	P-G	E	x	-	x
5 + 4C	XXpire (spinetoram+sulfoxaflor)	G, N	F	14	12 h	P-E	E	-	-	x	-	x
6	Avid EC (abamectin)	G, N, S	F	Contact	12 h	P-E	G-E	P	E	x	-	x
7A	Enstar AQ (kinoprene)	G, I, L, S	S	-	4 h	-	-	-	-	x	-	-
9B	Rycar, NNI-0101 (pyrifluquinazon)	G	-	10	12 h	P-G	P	-	P	x	-	x
9D	Ventiga, BAS 440 (afidopyropen)	G, I, L, N, S	-	7	12 h	-	P	-	-	-	-	-
13	Pylon 2SC (chlorfenapyr)	G	M	7-14	12 h	F-E	E	-	G	x	-	x
15	Pedestal (novaluron)	G, N, S	S	7-14	12 h	P	-	-	G	x	-	-
18B	AzaGuard, Azatin XL, Molt-X, Ornazin, etc. (azadirachtin)	G, I, N, S	S	7	4 h	P-G	P-F	P	P	x	-	-
21A	Hachi-Hachi EC (tolfenpyrad)	G	F	7-14	12 h	P-E	G	-	E	x	-	x
23	Kontos, BYI-8330 (spirotetramat)	G, I, N	S	7-14	24 h	P-F	P	P	G	x	-	x
28	Mainspring, A20520A, DPX-HGW86 (cyantraniliprole)	G, I	F	-	4 h	P-E	P-F	-	-	x	-	x
	Sarisa, IKI-3106 (cyclaniliprole)	G, N, S	-	7	4 h	P-E	P	-	-	-	-	-
28 + 4A	A16901B (cyantraniliprole + thiamethoxam)	TBD	-	-	-	E	-	-	-	-	-	-
29	Aria (flonicamid)	G, I, N	M	7-14	12 h	P-E	P-E	P	P	x	-	x
UN	Overture 25 WP (pyridaly)	G	M	7-14	12 h	P-E	F	P	F	x	-	x
UNB	Venerate, MBI-206 ( <i>Burkholderia</i> sp. strain A396)	G, N	S	-	4 h	P-E	-	-	-	x	-	x

IRAC Class	Foliar Applied Insecticides (active ingredients)	Registered Use Site(s)	Knock Down	Residual Control (days)	REI	Thrips Efficacy				Life Stage		
						Western Flower	Chilli	***Gynaikothrips	Gladiolus	Immatures	Pupae	Adults
UNE	Captiva (Capsicum oleoresin extract + Garlic oil + Soybean oil)	G, N	-	-	4 h	-	P	-	-	-	-	-
	Ecotrol (rosemary and peppermint oils)	G, N	?	-	-	-	-	-	-	x	-	x
	M-Pede, Safer Soap (potassium salts of fatty acids)	G, I, N	F	Contact	12 h	P	-	P	-	x	-	-
	Proud 3 (thyme oil)	TBD	-	5-7	0 h	P-G	-	-	-	x	-	x
UNF	BotaniGard, Mycotrol ( <i>Beauveria bassiana</i> )	G, I, N, S	M	3	4 h	P-E	F	P	-	x	x	x
	Met 52, Tick Ex ( <i>Metarhizium anisopliae</i> F52)	G, N	M	5-7	4 h	P-F	F	-	P	x	-	x
	NoFly WP ( <i>Paecilomyces fumosoroseus</i> strain FE 9901)	G	M	3-7	4 h	P-E	P - E	P - E	P - E	x	-	x
	Velifer ( <i>Beauveria bassiana</i> strain PPRI 5339)	G	-	3-14	12 h	P	-	-	-	-	-	-
UNF + 3A	BotaniGard MAXX, Xpectro OD, ( <i>Beauveria bassiana</i> + pyrethrins)	G, I, N, S	F	-	12 h	F <sup>a</sup>	-	-	-	-	-	-
UNM	Surround WP (kaolin)	G	-	Contact	4 h	-	P	G	-	x	-	x
	Ultra pure oil, SuffOil-X, etc. (paraffinic oil)	G, N	F	Contact	4 h	G-E	F	-	P	x	-	x
-	Cinnacure (cinnamaldehyde)	G, N	F	Contact	4 h	-	-	-	-	x	-	x
-	Grandevo, MBI-203 DF ( <i>Chromobacterium subsugae</i> strain PRAA4-1 <sup>T</sup> )	G, N	S	-	4 h	P-E	-	-	-	x	-	x
-	Sucrashield (sucrose octanoate)	G, N	-	Contact	48 h	-	-	-	-	x	-	x
-	Sorbishield 90 (sorbitol octanoate)	G, N	-	Contact	24 h	P	-	-	-	x	-	x
<b>Experimental Products</b>												
3A + 4A	Allectus (bifenthrin + imidacloprid) <sup>b</sup>	TBD	F	-	12 h	P	-	E	E	x	-	x
3A + 4A	Aloft (bifenthrin + clothianidin)	TBD	F	-	12 h	-	E	-	-	x	-	-
4A	Arena, Celero (clothianidin)	TBD	-	-	12 h	P-E	-	G	E	x	-	x
UNE	QRD 416 (oil extract from <i>Chenopodium</i> sp) <sup>a</sup>	TBD	-	-	-	P	-	-	-	x	-	-
UNM	Milstop (potassium bicarbonate)	G, I, L, N, S	-	-	1h	-	-	P	-	x	-	-
-	ADV 5004	TBD	-	-	-	-	-	-	-	-	-	-
-	BCS-507 (BCS-507)	TBD	-	-	-	P	-	-	-	-	-	-
-	BW133 (BW133)	TBD	-	-	-	P	-	-	-	-	-	-
-	BW238 (BW238 ES)	TBD	-	-	-	P	-	-	-	-	-	-
-	BW238 (BW238 WP)	TBD	-	-	-	P	-	-	-	-	-	-
-	ISM-555(ISM-555, A21377X)	TBD	-	-	-	E	-	-	-	-	-	-
-	MBI 203 SC2 (MBI 203)	TBD	-	-	-	P-G	-	-	-	-	-	-
-	MBI 306(MBI 306)	TBD	-	-	-	P-G	-	-	-	-	-	-
-	SP3014 (SP3014)	TBD	-	-	-	P	-	-	-	-	-	-
-	SP3014 (SP3014)	TBD	-	-	-	P-G	-	-	-	-	-	-
-	Tricon (sodium tetraborohydrate decahydrate)	TBD	-	-	12 h	P-E	-	P	P	x	-	x
-	V-10433 (V-10433)	TBD	-	-	-	P-G	-	-	-	-	-	-

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.



## Registered and Experimental Products for Thrips Management

Residual Control taken from product technical and label info, recommendations on earliest application intervals; Efficacy ratings taken from the 2019 IR-4 efficacy summary, 3 additional IR-4 trials, and 3 AMT reports. Effect on biological control agents for thrips taken from Koppert, Biobest and some extension publications/recommendations.

<sup>a</sup> Efficacy rating based on three BotaniGard MAXX trials provided by Bioworks, and a 2020 IR-4 trial.

\* 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.

\*\*\* *Gynaikothrips sp.* produces galls making it very difficult to control them with contact insecticides.

\*\*\*\* Drenches of this product are typically less problematic than foliar applications and can be used in a maintenance program if additional releases are made.

<sup>a</sup> 12 h in California

<sup>b</sup> No longer available for testing

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