



Environmental Horticulture Program Research Project Sheet

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

Project Name: Thrips Efficacy

New	Ongoing	X	Completed	Duration if ongoing or completed:	2006 - 2023
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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. Since it first was established as a high priority national project, thrips efficacy has been prioritized highly nationally and regionally.

Research Project Abstract (if available):

Abstract from the 2022 Thrips Efficacy Summary
 For the last 16 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 2021, 78 products representing 67 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 (*Dendrothrips 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, Yellow Tea Thrips (*Scirtothrips dorsalis*)
- Gladiolus Thrips (*Thrips simplex*)
- Gynaikothrips uzeli (*Gynaikothrips uzeli*)
- Orchid Thrips (*Chaetanaphothrips orchidii*)
- Privet Thrips (*Dendrothrips ornatus*)
- Thrips, Western Flower (*Frankliniella occidentalis*)

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

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| <i>Anthurium andraeanum</i> | <i>Pelargonium sp.</i> |
| <i>Buddleia davidii</i> | <i>Petunia sp.</i> |
| <i>Callistephus chinensis</i> | <i>Portulaca sp.</i> |
| <i>Chrysanthemum/Dendranthema x morifolium</i> | <i>Rhaphiolepis indica</i> |
| <i>Cosmos sp.</i> | <i>Rosa sp.</i> |
| <i>Distylium sp.</i> | <i>Tagetes erecta</i> |
| <i>Ficus benjamina</i> | <i>Tagetes patula</i> |
| <i>Forestiera neomexicana</i> | <i>Tagetes sp.</i> |
| <i>Gerbera sp.</i> | <i>Verbena sp.</i> |
| <i>Gladiolus sp.</i> | <i>Viola X wittrockiana</i> |
| <i>Glandularia X hybrida</i> | <i>Zinnia sp.</i> |

Impatiens hawkeri
Target Product(s)(list tested products or numbered compounds if ongoing or completed project)

A16901B 45WG (Thiamethoxam + cyantraniliprole)	Marathon 1% granular (Imidacloprid)
Acelepryn (Dupont) (Chlorantraniliprole)	Marathon II (Imidacloprid)
Allectus SC (Bifenthrin + Imidacloprid)	Marathon Ultra (Imidacloprid + cyfluthrin)
Aloft SC (Clothianadin + bifenthrin)	MBI 203 SC2 (MBI 203)
Altus (Flupyradifurone)	Mesurool 75-W (Methicarb)
Amblyseius cucumeris (Amblyseius cucumeris)	Met52 (Metarhizium anisopliae strain F52)
Aria 50SG (Flonicamid)	MilStop (Potassium bicarbonate)
Avid 0.15EC (Abamectin)	MOI 201 (MOI 201)
Aza-Direct (Azadirachtin)	M-Pede (Horticulture Soap)
AzaGuard (Azadirachtin)	NIO2ES-1 (NIO2ES-1)
Azatin XL (Azadirachtin)	OHP 929-2 (OHP 929-2)
BAS 320i (Metaflumizone)	Orthene TTO 97 (Valent) (Acephate)
BAS 350i (Fipronil)	Overture 35WP (Pyridalyl)
BCS-507 (BCS-507)	Pedestal (Novaluron)
Botanigard 22WP (Beauveria bassiana Strain GHA)	Pradia (Cyclaniliprole + Flonicamid)
BotaniGard ES (BioWorks) (Beauveria bassiana Strain GHA)	Proud 3 (Thyme oil)
BotaniGard ES (Laverlam International) (Beauveria bassiana Strain GHA)	Pylon (Chlorfenapyr)
BotaniGard MAXX (Pyrethrins + Beauveria bassiana Strain GHA)	QRD 400 (Extract of Chenopodium ambrosioides)
Bountify (MBI 306) (Burkholderia rinojensis strain A396)	QRD 416 (Extract of Chenopodium ambrosioides)
BW133 (BW133)	Rycar (Pyrifluquinazon)
BW238 ES (BW238 ES)	S1812 35WP VC1638 (Pyridalyl)
BW238 WP (BW238 WP)	Safari 20SG (Dinotefuran)
BW279N (BW279N)	Safari 2G (Dinotefuran)
Capsil (Blend of polyether-and polymethylsiloxane copolymer and nonionic surfactants)	Safer Soap (Potassium salts of fatty acids)
Carzol SP (Formetanate hydrochloride)	Sarisa 50SL (Cyclaniliprole)
Celero 16WSG (Clothianadin)	Scimitar CS (Lambda-cyhalothrin)
Conserve SC (Spinosad)	Sevin SL (Carbaryl)
Diazinon 50W (Diazinon)	SP3014 (SP3014)
Dimethoate 4EC (Drexel) (Dimethoate)	Surround WP (Kaolin Clay)
Discus (Imidacloprid + cyfluthrin)	Talstar Flowable Insecticide/Miticide (Bifenthrin)
DPX-HGW86 (Cyantraniliprole)	Talstar NF (Bifenthrin)
Dursban 50 W (Chlorpyrifos)	Tempo Ultra (Cyfluthrin)
EcoTrol (Rosemary Oil)	TetraCURB Concentrate (Rosemary Oil)
Flagship 25WG (Thiamethoxam)	TetraCURB Max (castor oil + rosemary oil + clove oil + peppermint oil)
Grandevo (MBI 203 DF) (Chromobacterium subsugae NRRL B-30655)	TetraCURB Organic (Rosemary Oil)
Hachi-Hachi EC (Tolfenpyrad)	TickEx EC (Metarhizium anisopliae)
Hachi-Hachi SC (Tolfenpyrad)	TriCon (BW 420) (Sodium tetraborahydrate decahydrate)
ISM-555 (ISM-555, A21377X)	TriStar 30SG (Acetamiprid)
KOC22018-8 (Botanical Oil Blend)	TriStar 70WSP (Acetamiprid)
Kontos 240SC (Spirotetramat)	V-10433 (V-10433)
Mainspring GNL 200SC (Cyantraniliprole)	Velifer (Beauveria bassiana Strain PPRI 5339)
	Venerate CG (Burkholderia rinojensis strain A396)
	Xxpire 40WG (Spinetoram + sulfoxafloor)

Product Registration and Research Status				
	Fully Screened (also includes standards)		Partially Screened through IR-4 ¹	Need Data for Additional Species?
Labeled for Thrips Generally & Commercialized	Conserve SC * Flagship 25WG Marathon II Marathon Ultra Orthene TTO * Pedestal	Pylon * Safari 20SG * Scimitar CS Talstar NF Tempo Ultra TriStar 30SG	Avid 0.15EC Aria 50SG * AzaGuard Grandevo (MBI 203 DF) Hachi-Hachi * Met 52 EC (TickExEC)* Overture 35WP * Proud 3	Allectus SC ² Aloft SC ² 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 Rycar (NNI-0101)	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 Mesurol 75W	MOI 201 QRD 400 QRD 416 Sevin SL TriCon (BW420)	Acelepryn * BAS 320i Celero 16WSG ² Kontos * 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

PROS	CONS
Thrips remain a hard to manage pest	Several IRAC classes are available for resistance management
Very few materials for outdoor uses on WFT	Very few new tools and new classes for screening
Need data on various thrips species other than WFT	A lot of data available already for WFT
Insecticide resistance in greenhouse thrips populations is common; hence, resistance management is essential	Some growers not utilizing effective resistance management strategies therefore resistant thrips spreading (not necessarily a specific project con)
Three + unregistered tools to screen	Hachi-Hachi not labeled in NY
Successful project for registrations	
Limited number of materials in commercial cut flower operations	
OHP looking to gather more data on Sarisa	
Hachi-Hachi labeled for outdoor applications	
Spears T is labeled for cut flowers	

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>)
FRAC BM01	Proud 3 (Thyme oil)						2.1 (1 - 5) n7
FRAC BM02	Grandevo (MBI 203 DF) (<i>Chromobacterium subtsugae</i> NRRL B-30655)						1.4 (1 - 3) n7 Labeled
FRAC BM02 & IRAC UNB	Venerate CG (<i>Burkholderia rinojensis</i> strain A396)	1.0 (1 - 1) n1 Labeled					1.4 (1 - 5) n17 Labeled
FRAC NC	BW133 (BW133)						1.0 (1 - 1) n2
FRAC NC	MilStop (Potassium bicarbonate)			1.0 (1 - 1) n2			
FRAC NC	MOI 201 (MOI 201)					1.0 (1 - 1) n1	2.4 (1 - 4) n7
FRAC NC & IRAC UNB	Bountify (MBI 306) (<i>Burkholderia rinojensis</i> strain A396)						2.1 (1 - 5) n7
FRAC NC & IRAC UNF	Met52 (<i>Metarhizium anisopliae</i> strain F52)						1.0 (1 - 1) n2 Labeled
FRAC P07	M-Pede (Horticulture Soap)						1.0 (1 - 1) n1 Labeled
FRAC P07	Safer Soap (Potassium salts of fatty acids)			1.0 (1 - 1) n2 Labeled			
IRAC 13	Pylon (Chlorfenapyr)	5.0 (5 - 5) n1 Labeled	4.0 (4 - 4) n1 Labeled				3.6 (1 - 5) n17 Labeled
IRAC 15	Pedestal (Novaluron)		5.0 (5 - 5) n1 Labeled				
IRAC 1A	Carzol SP (Formetanate hydrochloride)		4.0 (4 - 4) n1				
IRAC 1A	Mesurool 75-W (Methicarb)		4.0 (4 - 4) n1 Labeled				2.7 (1 - 5) n6 Labeled
IRAC 1A	Sevin SL (Carbaryl)			1.0 (1 - 1) n1			
IRAC 1B	Diazinon 50W (Diazinon)		5.0 (5 - 5) n1				
IRAC 1B	Dimethoate 4EC (Drexel) (Dimethoate)				4.0 (3 - 5) n2 Labeled		
IRAC 1B	Dursban 50 W (Chlorpyrifos)			1.0 (1 - 1) n1			

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IRAC 1B	Orthene TTO 97 (Valent) (Acephate)		5.0 (5 - 5) n1 Labeled	2.0 (2 - 2) 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	3.2 (1 - 5) n23 Labeled
IRAC 21A	Hachi-Hachi SC (Tolfenpyrad)						5.0 (5 - 5) n1 Labeled
IRAC 22B	BAS 320i (Metaflumizone)						1.3 (1 - 2) n4
IRAC 23	Kontos 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
IRAC 28	DPX-HGW86 (Cyantraniliprole)						3.7 (2 - 5) n3 Labeled
IRAC 28	Mainspring GNL 200SC (Cyantraniliprole)	2.0 (2 - 2) n1 Labeled					4.0 (3 - 5) n9 Labeled
IRAC 28	Sarisa 50SL (Cyclaniliprole)	1.0 (1 - 1) n2 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 /	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

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IRAC 29 + IRAC UN	Tank Mix: Aria + Rycar (Fonicamid + pyrfluquinazon)						3.3 (1 - 5) n3
IRAC 2B	BAS 350i (Fipronil)						5.0 (5 - 5) n1
IRAC 3 + IRAC 4A	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
IRAC 3A	Talstar Flowable Insecticide/Miticide (Bifenthrin)		4.0 (4 - 4) n1				
IRAC 3A	Talstar NF (Bifenthrin)			4.8 (4 - 5) n4 Labeled			
IRAC 3A	Tempo Ultra (Cyfluthrin)			2.0 (2 - 2) n1			
IRAC 3A + IRAC UNF	BotaniGard MAXX (Pyrethrins + Beauveria bassiana Strain GHA)						2.7 (1 - 5) n3 Labeled
IRAC 4A	Celero 16WSG (Clothianadin)		4.0 (4 - 4) n1	2.5 (1 - 4) n2			2.3 (1 - 4) n7
IRAC 4A	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
IRAC 4A	Marathon 1% granular (Imidacloprid)			1.0 (1 - 1) n1 Labeled			
IRAC 4A	Marathon II (Imidacloprid)		4.0 (4 - 4) n1				
IRAC 4A	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
IRAC 4A	Safari 2G (Dinotefuran)	3.0 (3 - 3) n1					
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	TriStar 70WSP (Acetamiprid)						5.0 (5 - 5) n1
IRAC 4A + IRAC 28	A16901B 45WG (Thiamethoxam + cyantraniliprole)						3.6 (1 - 5) n7 Labeled
IRAC 4A + IRAC 3	Aloft SC (Clothianadin + bifenthrin)	3.0 (3 - 3) n1					
IRAC 4A + IRAC 3A	Discus (Imidacloprid + cyfluthrin)		5.0 (5 - 5) n1 Labeled	2.0 (1 - 3) n2 Labeled			
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

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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	2.9 (1 - 5) n34 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)	4.0 (4 - 4) n1 Labeled					3.5 (2 - 5) n6 Labeled
IRAC 6	Avid 0.15EC (Abamectin)	3.5 (3 - 4) n2 Labeled	4.0 (4 - 4) n1 Labeled	1.0 (1 - 1) n1 Labeled	3.0 (3 - 3) n1 Labeled		3.1 (1 - 5) n15 Labeled
IRAC UN	Aza-Direct (Azadirachtin)						1.0 (1 - 1) n1 Labeled
IRAC UN	AzaGuard (Azadirachtin)						2.0 (1 - 3) n9 Labeled
IRAC UN	Azatin XL (Azadirachtin)		3.0 (3 - 3) n1 Labeled	1.0 (1 - 1) n2 Labeled			
IRAC UN	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
IRAC UN	Rotation: Aza-Direct / M-Pede (Azadirachtin / horticultural soap)						2.0 (2 - 2) n1
IRAC UN	Rycar (Pyrifluquinazon)	1.0 (1 - 1) n1 Labeled	3.0 (3 - 3) n1 Labeled			3.0 (3 - 3) n1 Labeled	1.7 (1 - 5) n16 Labeled
IRAC UN	S1812 35WP VC1638 (Pyridalyl)						3.5 (2 - 5) n4
IRAC UN	Tank Mix: Aza-Direct + M-Pede (Azadirachtin + horticultural soap)						2.0 (2 - 2) n1
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
IRAC UNE	QRD 400 (Extract of Chenopodium ambrosioides)	1.0 (1 - 1) n1					3.5 (3 - 4) n2
IRAC UNE	QRD 416 (Extract of Chenopodium ambrosioides)						1.0 (1 - 1) n2
IRAC UNE	TetraCURB Concentrate (Rosemary Oil)						2.5 (1 - 4) n2
IRAC UNE	TetraCURB Organic (Rosemary Oil)						1.0 (1 - 1) n2

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unknown	Capsil (Blend of polyether-and polymethylsiloxane copolymer and nonionic surfactants)			1.0 (1 - 1) n3			
unknown	ISM-555 (ISM-555, A21377X)						4.7 (3 - 5) n7
unknown	KOC22018-8 (Botanical Oil Blend)						4.5 (4 - 5) n2
unknown	MBI 203 SC2 (MBI 203)						2.0 (1 - 5) n7
unknown	OHP 929-2 (OHP 929-2)						3.0 (1 - 5) n2
unknown	SP3014 (SP3014)						2.5 (1 - 5) n10
unknown	TetraCURB Max (castor oil + rosemary oil + clove oil + peppermint oil)						3.0 (1 - 5) n2
unknown	TriCon (BW 420) (Sodium tetraborahydrate decahydrate)		1.0 (1 - 1) n1	1.0 (1 - 1) n1			3.3 (1 - 5) n6
unknown	V-10433 (V-10433)						2.4 (1 - 5) n10
UNM	Surround WP (Kaolin Clay)			4.0 (4 - 4) n1 Labeled			