

Project Name: Bacteria Efficacy

Dates Active: 2006-2012; 2016-2017; 2020-2023

Project Description:

Studying bacterial diseases arose in the IR-4 Southern Regional as a regional project. Since 2006, this became a high priority national project with the increased number of potential actives available for screening. Seventy-four products have been screened including antibiotics, biopesticides, plant extracts, conventionals, and copper-based materials.

Research Project Abstract:

Abstract from 2024 Bacterial Disease Efficacy Summary

From 2008 to 2022, 83 products were tested through the IR-4 Environmental Horticulture Program as foliar or drench applications against bacterial pathogens. In addition to research collected through the IR-4 program, this summary includes a review of experiments conducted from 2005 to 2017, mainly on tree crops. Species tested included: *Agrobacterium tumefaciens*, *Erwinia amylovora*, *E. chrysanthemi*, *Pseudomonas cichorii*, *P. marginalis*, *P. syringae*, *Pseudomonas sp.*, *Xanthomonas axonopodis*, *Xanthomonas campestris*, and *Xanthomonas spp.* In general, all products, including the standard copper containing bactericides (Camelot, CuPRO, Cuprofix, Cuprofix MZ, Junction, Kocide, MasterCop, Phyton 27, ReZist, etc.), mancozebs (Dithane, Penncozeb, Protect) and biologicals (Cease, Regalia, Rhapsody and Serenade), provided variable efficacy on these bacterial pathogens. Several new products that looked promising based on their efficacy relative to standards including, CG100, Citrex, HM-0736, Insimmo, Postiva, Proud 3, Stargus, Taegro, Tril-21 and ZeroTol. Further research is needed to obtain additional efficacy data to recommend actions to register or amend labels for these pests.

Target Species (Phytotoxicity, or common and Latin name of arthropod, pathogen, weed):	
<i>Agrobacterium sp.</i>	<i>Pseudomonas marginalis</i>
<i>Erwinia sp.</i>	<i>Pseudomonas sp.</i>
<i>Erwinia chrysanthemi</i> (<i>Dickeya</i> (<i>Erwinia</i>) <i>chrysanthemi</i>)	<i>Pseudomonas Syringae</i> Blight (<i>Pseudomonas syringae</i>)
<i>Pseudomonas chichorii</i>	<i>Xanthomonas sp.</i>

Target Crops (list tested crops if ongoing or completed project)	
Maple, Japanese (<i>Acer palmatum</i>) Ornamental Cabbage/Kale (<i>Brassica oleracea</i>) Chrysanthemum, Garden (<i>Chrysanthemum/Dendranthema sp.</i>) Poinsettia (<i>Euphorbia pulcherrima</i>) Chinese Banyan (<i>Ficus retusa</i>) Sunflower (<i>Helianthus sp.</i>) Rosemallow (<i>Hibiscus sp.</i>) Hydrangea, Oakleaf (<i>Hydrangea quercifolia</i>) Impatiens, Common Garden (<i>Impatiens walleriana</i>) Lavender (<i>Lavandula sp.</i>)	Bolivian Jasmine (<i>Mandevilla boliviensis</i>) Wax Myrtle (<i>Myrica cerifera</i>) Orchid, Dancing Lady (<i>Oncidium sp.</i>) Geranium (<i>Pelargonium sp.</i>) Orchid, Moth (<i>Phalaenopsis sp.</i>) Prunus, Non-bearing (<i>Prunus sp.</i>) Callery Pear (<i>Pyrus calleryana</i>) Goldenrod (<i>Solidago sp.</i>) Lilac (<i>Syringa sp.</i>) Zinnia (<i>Zinnia sp.</i>)

Target Product(s)(list tested products or numbered compounds if ongoing or completed project)	
Actinovate Soluble (<i>Streptomyces lydicus</i> WYEC 108) Agrimycin 17 (<i>Streptomycin sulfate</i>) Agriphage (<i>Bacteriophage</i> (for <i>Xanthomonas campestris</i> pv. <i>vesicatoria</i> and <i>Pseudomonas syringae</i> pv. <i>tomato</i>)) Alexin (Fruit and vegetable extract) Aliette WDG (Fosetyl AI) ASAP (Silver) BlightBan A506 (<i>Pseudomonas fluorescens</i> A506) Bloomtime FD (<i>Pantoea agglomerans</i> strain E325) BMJ LC / LifeGard LC (<i>Bacillus mycoides</i> isolate J) BotryStop WP (<i>Ulocladium oudemansii</i> (U3 Strain)) BW165N (<i>Ulocladium oudemansii</i> (U3 Strain)) Camelot (Copper salts of fatty and rosin acids) Canker Kill (Unknown) Cease (<i>Bacillus subtilis</i> strain QST 713) CG100 (Caprylic acid) Champ Formula 2F (Copper hydroxide) Citrex (Citrus extraction) Companion (<i>Bacillus subtilis</i> GB03) Copper Count N (copper diammonia diacetate complets) CuPro (Copper hydroxide)	Firewall 17WP (<i>Streptomycin sulfate</i>) Flameout (<i>Oxytetracycline</i>) Florel (Ethephon) Inosco (Potassium phosphite) Insimmo (Acibenzolar-S-methyl) Junction (SePro) (Mancozeb + copper hydroxide) Kasumin (Kasugamycin) Kleengrow (Didecyl dimethyl ammonium chloride) Kocide 2000 (Dupont) (Copper Hydroxide) Kocide 3000 (Copper hydroxide) K-Phite (Phosphorus acid salts) MBI 121 (MBI 121) Milsana (now Regalia) (Extract of <i>Reynoutria sachalinensis</i>) MilStop (Potassium bicarbonate) NAI-4201 (Tiadinil) Nu-Cop 50DF (Copper Hydroxide) Omega Grow Plus (Fish oil) OxiPhos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide) Penncozeb DF (Mancozeb) Phyton-27 (Copper sulfate pentahydrate)

Target Product(s)(list tested products or numbered compounds if ongoing or completed project)	
Cupro 2005 (Copper hydroxide)	Phyton-27 New Dimension (Copper sulphate pentahydrate)
Cuprofix MZ Disperse (Mancozeb + Basic copper sulfate)	Postiva (pydiflumetofen + difenoconazole)
CuproFix Ultra 40 Disperse (Basic copper sulfate)	Prophytex EC (Bacillus subtilis strain B1111)
Dithane 75DF Rainshield (Mancozeb)	Prophytex WP (Bacillus subtilis strain B1111)
EarthTec (Copper)	Protect T/O (Mancozeb)
Proud 3 (Thyme oil)	TDA-RTU (TDA-RTU)
RD00AS-1 (BW159) (BW159)	Terracyte Pro (PerCarb, GC Pro, GreenClean Max) (Sodium carbonate peroxyhydrate)
Regalia O5 (MOI-10605) (Extract of Reynoutria sachalinensis)	Triathlon (Bacillus amyloliquefaciens Strain D747)
Regalia SC (MOI 106) (Extract of Reynoutria sachalinensis)	TriCon (BW 420) (Sodium tetraborahydrate decahydrate)
ReZist (Aluminium ammonium sulphate)	Tril-21 (Thyme oil)
SP2015 (SP2015)	TXC2020 (Thyme oil)
SP2478 (SP2478)	USF 0914 (USF 0914)
SP2704 (SP2704)	USF 2018a (USF 2018a)
SP8000 (SP8000)	Vacciplant (Laminarin)
Stargus (Bacillus nakamurai strain F727)	Vital 4L (Potassium phosphite)
Taegro (Bacillus subtilis var amyloliquefaciens strain FZB24)	Vitalonil (Potassium phosphite + chlorothalonil)
Tanos (Famoxadone + Cymoxanil)	ZeroTol (Hydrogen dioxide)
TDA02 (TDA01)	ZeroTol 2.0 (Hydrogen dioxide + peroxyacetic acid)

Products/Crops Registered through IR-4Research:					
	Fully Screened (also includes standards)		Partially Screened through IR-4 ¹		Need Data Across Species ?
Labeled Generally & Commercialized	Adorn * Aliette DisArm FenStop Pageant *	RootShield Plus * Segway * Subdue Maxx * Terrazole	Banol Banrot Cease Companion Empress * Heritage	Hurricane PlantShield RootShield Phosphorus Acid Salts ¹ SoilGard	Actinovate Captan Mycostop Taegro
Labeled Generally But NOT Commercialized					
Labeled for Specific Pest & Commercialized					
Labeled for Specific Pest but NOT Commercialized					
Not yet registered or labeled for Pest			Bas 703 06F Bio-Tam CG100		
No longer available for development for Pest			A13839B Micora (NOA 446510) * Remedier SP20155 SP 2770 10WP SP 2771		
* IR-4 Data contributed to registration decision – either adding pest to label or not pursuing further research					
¹ Agri-Fos, Alude Magellan, Vital etc.					

IR-4 Efficacy Trials to Date
Average rating on a scale of 1 – 5 where 1 = <60% Control (not effective), 2 = 60-79% control, 3 = 80-89% control, 4 = 90-94% control and 5 = 95-100% control; minimum to maximum rating; number of trials (See table on next page). For product/pest combinations that are blank, IR-4 has not screened this combination. A rating of 3 or higher is considered commercially acceptable. 'Labeled' indicates that this pest species or genera is listed on the label.

Environmental Horticulture Program Research Project Sheet

<https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-extension-resources/>

Table 1 of 2.

MOA	Product (Actives)	<i>Agrobacterium sp.</i>	<i>Erwinia sp.</i>	<i>Erwinia chrysanthemi</i> (<i>Dickeya chrysanthemi</i>)	<i>Xanthomonas sp.</i>
/ FRAC M1	Rotation: Tricon / Phyton New Dimension (Sodium borate decahydrate / copper pentahydrate)				1.0 (1 - 1) n2
FRAC 11 + FRAC 27	SP2015 (SP2015)		1.0 (1 - 1) n2	1.0 (1 - 1) n3	2.2 (1 - 4) n5
FRAC 11 + FRAC 27	Tanos (Famoxadone + Cymoxanil)				1.0 (1 - 1) n1
FRAC 11 + FRAC 27 + FRAC M1	Tank Mix: SP2015 + CuPRO 2005 (Famoxadone + Cymoxanil + Copper)		1.5 (1 - 2) n2	1.0 (1 - 1) n3	2.4 (1 - 4) n10
FRAC 24	Kasumin (Kasugamycin)	1.0 (1 - 1) n1	1.3 (1 - 2) n4	1.0 (1 - 1) n3	1.6 (1 - 4) n10
FRAC 24 + FRAC M1	Tank Mix: Kasumin + Kocide (Kasugamycin + copper hydroxide)				1.7 (1 - 3) n3
FRAC 25	Agrimycin 17 (Streptomycin sulfate)	1.0 (1 - 1) n1 Labeled			
FRAC 25	Firewall 17WP (Streptomycin sulfate)				2.5 (2 - 3) n2
FRAC 41	Flameout (Oxytetracycline)				1.0 (1 - 1) n1
FRAC BM02	Actinovate Soluble (Streptomyces lydicus WYEC 108)				1.0 (1 - 1) n3 Labeled
FRAC BM02	BlightBan A506 (<i>Pseudomonas fluorescens</i> A506)				3.0 (3 - 3) n1
FRAC BM02	Bloomtime FD (<i>Pantoea agglomerans</i> strain E325)				2.0 (1 - 3) n2
FRAC BM02	Cease (<i>Bacillus subtilis</i> strain QST 713)				2.0 (1 - 4) n5 Labeled
FRAC BM02	Companion (<i>Bacillus subtilis</i> GB03)				2.0 (1 - 3) n2
FRAC BM02	Prophytex EC (<i>Bacillus subtilis</i> strain B1111)				3.0 (3 - 3) n1
FRAC BM02	Prophytex WP (<i>Bacillus subtilis</i> strain B1111)				3.0 (3 - 3) n1
FRAC BM02	Taegro (<i>Bacillus subtilis</i> var <i>amyloliquefaciens</i> strain FZB24)		1.0 (1 - 1) n2	2.3 (1 - 5) n3	2.0 (1 - 4) n6

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MOA	Product (Actives)	<i>Agrobacterium</i> sp.	<i>Erwinia</i> sp.	<i>Erwinia chrysanthemi</i> (Dickeya chrysanthemi)	<i>Xanthomonas</i> sp.
FRAC BM02 +	Tank Mix: Actinovate + Tricon (Streptomyces lydicus WYEC 108 + Sodium tetraborahydrate decahydrate)				1.0 (1 - 1) n2
FRAC BM02 + FRAC M1	Tank Mix: Rhapsody + Kocide (Bacillus subtilis + copper hydroxide)				3.0 (3 - 3) n1
FRAC BM02 + FRAC M1	Tank Mix: Rhapsody + Phyton (Bacillus subtilis + copper sulfate pentahydrate)				3.0 (3 - 3) n1
FRAC BM02 + FRAC M1 + FRAC P07	Tank Mix: Rhapsody + Kocide 2000 + Vital (Bacillus subtilis + copper hydroxide + potassium phosphite)				1.0 (1 - 1) n2
FRAC BM02 + FRAC M3	Tank Mix: Rhapsody + Penncozeb (Bacillus subtilis + mancozeb)				3.0 (3 - 3) n1
FRAC BM02 + FRAC NC	Tank Mix: Cease + Citrex (Bacillus subtilis + Citrus extraction)				2.0 (2 - 2) n1
FRAC BM02 + FRAC NC	Tank Mix: Cease + Milstop (Bacillus subtilis + potassium bicarbonate)		1.0 (1 - 1) n2	1.0 (1 - 1) n1	1.0 (1 - 1) n1
FRAC BM02 + FRAC NC	Tank Mix: Cease + TriCon (Bacillus subtilis + Sodium tetraborahydrate decahydrate)				3.0 (3 - 3) n1
FRAC BM02 + FRAC NC	Tank Mix: Rhapsody + Actinovate (Bacillus subtilis + Streptomyces lydicus WYEC 108)				1.0 (1 - 1) n1
FRAC BM02 + FRAC NC	Tank Mix: Taegro + Milstop (Bacillus subtilis var amyloliquefaciens strain FZB24 + potassium bicarbonate)				1.0 (1 - 1) n1
FRAC BM02 + FRAC P07	Tank Mix: Rhapsody + K-Phyte (Bacillus subtilis + phosphorus acid salts)				1.0 (1 - 1) n1
FRAC M1	Camelot (Copper salts of fatty and rosin acids)		2.0 (2 - 2) n1		2.5 (2 - 3) n2
FRAC M1	Champ Formula 2F (Copper hydroxide)				3.0 (2 - 4) n2
FRAC M1	Copper Count N (copper diammonia diacetate complets)			1.0 (1 - 1) n1	
FRAC M1	CuPro (Copper hydroxide)				3.0 (3 - 3) n1

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MOA	Product (Actives)	<i>Agrobacterium</i> sp.	<i>Erwinia</i> sp.	<i>Erwinia chrysanthemi</i> (Dickeya chrysanthemi)	<i>Xanthomonas</i> sp.
FRAC M1	CuPro 2005 (Copper hydroxide)		1.5 (1 - 3) n4 Labeled	1.5 (1 - 2) n2 Labeled	2.3 (2 - 3) n3 Labeled
FRAC M1	CuproFix Ultra 40 Disperse (Basic copper sulfate)				3.5 (2 - 5) n2 Labeled
FRAC M1	EarthTec (Copper)				1.0 (1 - 1) n1
FRAC M1	Kocide 2000 (Dupont) (Copper Hydroxide)				1.8 (1 - 4) n4 Labeled
FRAC M1	Kocide 3000 (Copper hydroxide)				3.0 (1 - 4) n4
FRAC M1	Nu-Cop 50DF (Copper Hydroxide)				
FRAC M1	Phyton-27 (Copper sulfate pentahydrate)				3.0 (3 - 3) n3 Labeled
FRAC M1	Phyton-27 New Dimension (Copper sulphate pentahydrate)				1.0 (1 - 1) n2 Labeled
FRAC M1	ReZist (Aluminium ammonium sulphate)			1.0 (1 - 1) n1	
FRAC M1	Tank Mix: Resist + Sett (Chelated Copper/Manganese/Zinc + Calcium/Boron + surfactant)			3.0 (3 - 3) n1	
FRAC M1 +	Tank Mix: Kocide + Kleengrow (Copper Hydroxide + Didecyl dimethyl ammonium chloride)		2.0 (2 - 2) n1		
FRAC M3	Dithane 75DF Rainshield (Mancozeb)				3.0 (2 - 4) n2
FRAC M3	Penncozeb DF (Mancozeb)				3.5 (2 - 5) n2
FRAC M3	Protect T/O (Mancozeb)		3.0 (3 - 3) n1		3.0 (3 - 3) n1
FRAC M3 + FRAC M1	Cuprofix MZ Disperse (Mancozeb + Basic copper sulfate)				3.5 (3 - 4) n2 Labeled
FRAC M3 + FRAC M1	Junction (SePro) (Mancozeb + copper hydroxide)				3.5 (2 - 5) n2
FRAC NC	Alexin (Fruit and vegetable extract)				1.0 (1 - 1) n1
FRAC NC	CG100 (Caprylic acid)	1.0 (1 - 1) n1	1.0 (1 - 1) n3	1.0 (1 - 1) n1	1.7 (1 - 3) n3
FRAC NC	Citrex (Citrus extraction)	1.0 (1 - 1) n1	1.3 (1 - 2) n4	1.0 (1 - 1) n3	2.9 (2 - 4) n7

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MOA	Product (Actives)	<i>Agrobacterium</i> sp.	<i>Erwinia</i> sp.	<i>Erwinia chrysanthemi</i> (Dickeya chrysanthemi)	<i>Xanthomonas</i> sp.
FRAC NC	MilStop (Potassium bicarbonate)				1.0 (1 - 1) n1
FRAC NC	Omega Grow Plus (Fish oil)				1.0 (1 - 1) n1
FRAC NC	ZeroTol (Hydrogen dioxide)	1.0 (1 - 1) n1 Labeled			1.0 (1 - 1) n1 Labeled
FRAC NC	ZeroTol 2.0 (Hydrogen dioxide + peroxyacetic acid)				3.0 (3 - 3) n1 Labeled
FRAC P01	Insimmo (Acibenzolar-S-methyl)	1.0 (1 - 1) n2	1.7 (1 - 4) n7	1.0 (1 - 1) n3	3.7 (3 - 5) n6
FRAC P03	NAI-4201 (Tiadinil)	1.0 (1 - 1) n1	1.3 (1 - 2) n3	1.0 (1 - 1) n1	1.0 (1 - 1) n2
FRAC P04	Vacciplant (Laminarin)	1.0 (1 - 1) n1 Labeled	1.0 (1 - 1) n4 Labeled	1.0 (1 - 1) n3 Labeled	1.7 (1 - 3) n6 Labeled
FRAC P04 + FRAC M1	Tank Mix: Physpe + Kocide 2000 (Laminarin + copper hydroxide)				3.0 (3 - 3) n1
FRAC P04 + FRAC M1	Tank Mix: Physpe + Phyton (Laminarin + copper sulfate pentahydrate)				3.0 (3 - 3) n1
FRAC P04 + FRAC M3	Tank Mix: Physpe + Penncozeb (Laminarin + mancozeb)				1.0 (1 - 1) n1
FRAC P05	Milsana (now Regalia) (Extract of Reynoutria sachalinensis)				1.0 (1 - 1) n1
FRAC P05	Regalia O5 (MOI-10605) (Extract of Reynoutria sachalinensis)	1.0 (1 - 1) n1 Labeled	1.0 (1 - 1) n3 Labeled	1.0 (1 - 1) n1 Labeled	2.5 (1 - 4) n2 Labeled
FRAC P05	Regalia SC (MOI 106) (Extract of Reynoutria sachalinensis)		1.0 (1 - 1) n1		2.0 (2 - 2) n1
FRAC P06	BMJ LC / LifeGard LC (Bacillus mycoides isolate J)				1.0 (1 - 1) n1
FRAC P07	Aliette WDG (Fosetyl AI)		1.0 (1 - 1) n3 Labeled		3.0 (2 - 4) n2 Labeled
FRAC P07	Inosco (Potassium phosphite)		1.0 (1 - 1) n1		

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MOA	Product (Actives)	<i>Agrobacterium</i> sp.	<i>Erwinia</i> sp.	<i>Erwinia chrysanthemi</i> (<i>Dickeya chrysanthemi</i>)	<i>Xanthomonas</i> sp.
FRAC P07	K-Phite (Phosphorus acid salts)				1.0 (1 - 1) n3 Labeled
FRAC P07	OxiPhos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide)				3.0 (3 - 3) n1
FRAC P07	Vital 4L (Potassium phosphite)				2.0 (1 - 3) n2 Labeled
FRAC P07 + FRAC BM02	Tank Mix: Vital + Rhapsody (Potassium phosphite + <i>Bacillus subtilis</i>)				1.0 (1 - 1) n1
FRAC P07 + FRAC M1	Tank Mix: BioPhos + Chelated Copper (Phosphorus acid + chelated copper)				1.0 (1 - 1) n4
FRAC P07 + FRAC M1	Tank Mix: K-Phyte + Kocide 2000 (Phosphorus acid salts + copper hydroxide)				3.0 (3 - 3) n1
FRAC P07 + FRAC M1	Tank Mix: K-Phyte + Phytan (Phosphorus acid salts + copper sulfate pentahydrate)				3.0 (3 - 3) n1
FRAC P07 + FRAC M3	Tank Mix: K-Phyte + Penncozeb (Phosphorus acid salts + mancozeb)				3.0 (3 - 3) n1
FRAC P07 + FRAC M5	Vitalonil (Potassium phosphite + chlorothalonil)				3.0 (3 - 3) n1
FRAC P07 + FRAC NC	Tank Mix: K-Phite + Tricon (Phosphorus acid salts + Sodium tetraborate decahydrate)				1.0 (1 - 1) n2
IRAC 11 & FRAC BM02	Triathlon (<i>Bacillus amyloliquefaciens</i> Strain D747)				3.0 (3 - 3) n1
IRAC UNF & FRAC BM02	Stargus (<i>Bacillus nakamurai</i> strain F727)				3.0 (3 - 3) n1 Labeled
unknown	ASAP (Silver)				2.0 (2 - 2) n1
unknown	Canker Kill (Unknown)				1.0 (1 - 1) n1
unknown	Florel (Ethepon)		1.0 (1 - 1) n2		

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MOA	Product (Actives)	<i>Agrobacterium sp.</i>	<i>Erwinia sp.</i>	<i>Erwinia chrysanthemi</i> (<i>Dickeya chrysanthemi</i>)	<i>Xanthomonas sp.</i>
unknown	Kleengrow (Didecyl dimethyl ammonium chloride)		1.3 (1 - 2) n3 Labeled		
unknown	TDA-RTU (TDA-RTU)				3.0 (3 - 3) n1
unknown	Terracyte Pro (PerCarb, GC Pro, GreenClean Max) (Sodium carbonate peroxyhydrate)				3.0 (3 - 3) n1 Labeled
unknown	TriCon (BW 420) (Sodium tetraborahydrate decahydrate)				1.5 (1 - 3) n4
unknown	USF 0914 (USF 0914)				3.0 (3 - 3) n1
unknown	USF 2018a (USF 2018a)				3.0 (3 - 3) n1

Table 2 of 2.

MOA	Product (Actives)	<i>Pseudomonas chitorii</i>	<i>Pseudomonas marginalis</i>	<i>Pseudomonas sp.</i>	<i>Pseudomonas Syringae</i> Blight (<i>Pseudomonas syringae</i>)
/ FRAC M1	Rotation: Tricon / Phyton New Dimension (Sodium borate decahydrate / copper pentahydrate)	2.0 (2 - 2) n1	1.0 (1 - 1) n1		
FRAC 11 + FRAC 27	SP2015 (SP2015)	1.0 (1 - 1) n1		1.0 (1 - 1) n2	1.0 (1 - 1) n1
FRAC 11 + FRAC 27 + FRAC M1	Tank Mix: SP2015 + CuPRO 2005 (Famoxadone + Cymoxanil + Copper)	1.7 (1 - 3) n3	1.0 (1 - 1) n2	3.0 (3 - 3) n2	1.0 (1 - 1) n1
FRAC 24	Kasumin (Kasugamycin)	2.3 (1 - 3) n3	1.0 (1 - 1) n1	3.0 (1 - 5) n2	2.5 (1 - 5) n4
FRAC 24 + FRAC M1	Tank Mix: Kasumin + Kocide (Kasugamycin + copper hydroxide)	1.0 (1 - 1) n1	1.0 (1 - 1) n1		
FRAC 7 + FRAC 3	Postiva (pydiflumetofen + difenoconazole)				2.0 (1 - 3) n3 Labeled
FRAC BM01	Proud 3 (Thyme oil)				2.0 (1 - 3) n3
FRAC BM01	Tril-21 (Thyme oil)				3.0 (3 - 3) n2

Environmental Horticulture Program Research Project Sheet

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MOA	Product (Actives)	<i>Pseudomonas chicorii</i>	<i>Pseudomonas marginalis</i>	<i>Pseudomonas</i> sp.	<i>Pseudomonas Syringae</i> Blight (<i>Pseudomonas syringae</i>)
FRAC BM01	TXC2020 (Thyme oil)				1.0 (1 - 1) n1
FRAC BM02	BlightBan A506 (<i>Pseudomonas fluorescens</i> A506)	3.0 (3 - 3) n1			
FRAC BM02	Bloomtime FD (<i>Pantoea agglomerans</i> strain E325)	3.0 (3 - 3) n1			
FRAC BM02	BotryStop WP (<i>Ulocladium oudemansii</i> (U3 Strain))				2.0 (2 - 2) n1
FRAC BM02	BW165N (<i>Ulocladium oudemansii</i> (U3 Strain))	1.0 (1 - 1) n1			2.5 (2 - 3) n2
FRAC BM02	Cease (<i>Bacillus subtilis</i> strain QST 713)				1.0 (1 - 1) n1 Labeled
FRAC BM02	Taegro (<i>Bacillus subtilis</i> var <i>amyloliquefaciens</i> strain FZB24)	1.0 (1 - 1) n1		1.0 (1 - 1) n2	1.0 (1 - 1) n1
FRAC BM02 +	Tank Mix: Actinovate + Tricon (<i>Streptomyces lydicus</i> WYEC 108 + Sodium tetraborate hydrate)	2.0 (2 - 2) n2			
FRAC BM02 + FRAC M1 + FRAC P07	Tank Mix: Rhapsody + Kocide 2000 + Vital (<i>Bacillus subtilis</i> + copper hydroxide + potassium phosphite)	1.0 (1 - 1) n1	1.0 (1 - 1) n1		
FRAC M1	Camelot (Copper salts of fatty and rosin acids)				2.8 (2 - 5) n4
FRAC M1	CuPro (Copper hydroxide)				2.0 (2 - 2) n1
FRAC M1	CuPro 2005 (Copper hydroxide)	4.0 (3 - 5) n3 Labeled			3.0 (3 - 3) n1 Labeled
FRAC M1	EarthTec (Copper)				4.0 (4 - 4) n1
FRAC M1	Kocide 2000 (Dupont) (Copper Hydroxide)	1.0 (1 - 1) n1 Labeled	1.0 (1 - 1) n1 Labeled		1.0 (1 - 1) n1 Labeled
FRAC M1	Kocide 3000 (Copper hydroxide)	1.0 (1 - 1) n1	1.0 (1 - 1) n1		
FRAC M1	Nu-Cop 50DF (Copper Hydroxide)				2.0 (2 - 2) n1 Labeled

Environmental Horticulture Program Research Project Sheet

<https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-extension-resources/>

MOA	Product (Actives)	<i>Pseudomonas chicorii</i>	<i>Pseudomonas marginalis</i>	<i>Pseudomonas</i> sp.	<i>Pseudomonas Syringae</i> Blight (<i>Pseudomonas syringae</i>)
FRAC M1	Phyton-27 (Copper sulfate pentahydrate)			1.0 (1 - 1) n1 Labeled	
FRAC M1	Phyton-27 New Dimension (Copper sulphate pentahydrate)	1.0 (1 - 1) n1 Labeled	1.0 (1 - 1) n1 Labeled		
FRAC M3	Protect T/O (Mancozeb)	3.0 (3 - 3) n1			3.0 (1 - 5) n2
FRAC NC	CG100 (Caprylic acid)	1.0 (1 - 1) n2		3.0 (3 - 3) n1	1.3 (1 - 2) n4
FRAC NC	Citrex (Citrus extraction)	2.0 (1 - 3) n2		1.5 (1 - 2) n2	1.3 (1 - 2) n4
FRAC NC	ZeroTol (Hydrogen dioxide)	2.5 (2 - 3) n2 Labeled			1.3 (1 - 2) n3 Labeled
FRAC P01	Insimmo (Acibenzolar-S-methyl)	1.0 (1 - 1) n3		1.7 (1 - 3) n3	2.0 (1 - 4) n4
FRAC P03	NAI-4201 (Tiadinil)	1.0 (1 - 1) n1		2.0 (2 - 2) n1	1.5 (1 - 2) n2
FRAC P04	Vacciplant (Laminarin)	1.0 (1 - 1) n2 Labeled	1.0 (1 - 1) n1 Labeled	3.0 (3 - 3) n1 Labeled	1.0 (1 - 1) n3 Labeled
FRAC P05	Regalia O5 (MOI-10605) (Extract of Reynoutria sachalinensis)	2.0 (1 - 3) n2 Labeled			1.5 (1 - 2) n2 Labeled
FRAC P05	Regalia SC (MOI 106) (Extract of Reynoutria sachalinensis)			2.0 (1 - 3) n2	1.0 (1 - 1) n2
FRAC P07	Aliette WDG (Fosetyl Al)				1.5 (1 - 2) n2 Labeled
FRAC P07	Inosco (Potassium phosphite)	1.0 (1 - 1) n1			1.0 (1 - 1) n2
FRAC P07	K-Phite (Phosphorus acid salts)	1.0 (1 - 1) n1 Labeled	1.0 (1 - 1) n1 Labeled		
FRAC P07	OxiPhos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide)	1.0 (1 - 1) n1			
FRAC P07 + FRAC M1	Tank Mix: BioPhos + Chelated Copper (Phosphorus acid + chelated copper)	1.0 (1 - 1) n2	1.0 (1 - 1) n2		
FRAC P07 + FRAC NC	Tank Mix: K-Phite + Tricon (Phosphorus acid salts + Sodium tetraborahydrate decahydrate)	1.0 (1 - 1) n1	1.0 (1 - 1) n1		

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MOA	Product (Actives)	<i>Pseudomonas chicorii</i>	<i>Pseudomonas marginalis</i>	<i>Pseudomonas sp.</i>	<i>Pseudomonas Syringae</i> Blight (<i>Pseudomonas syringae</i>)
IRAC 11 & FRAC BM02	Triathlon (Bacillus amyloliquefaciens Strain D747)	2.0 (2 - 2) n1			
IRAC UNF & FRAC BM02	Stargus (Bacillus nakamurai strain F727)	2.0 (2 - 2) n1 Labeled			2.0 (1 - 3) n3 Labeled
unknown	Kleengrow (Didecyl dimethyl ammonium chloride)	1.0 (1 - 1) n1 Labeled			1.0 (1 - 1) n1 Labeled
unknown	MBI 121 (MBI 121)				1.7 (1 - 2) n3
unknown	RD00AS-1 (BW159) (BW159)				2.0 (2 - 2) n1
unknown	SP2704 (SP2704)				2.0 (2 - 2) n1
unknown	TDA02 (TDA01)	1.0 (1 - 1) n1		1.0 (1 - 1) n1	
unknown	TDA-NC-1 (TDA)				2.7 (2 - 3) n3
unknown	Terracyte Pro (PerCarb, GC Pro, GreenClean Max) (Sodium carbonate peroxyhydrate)	1.0 (1 - 1) n1 Labeled			
unknown	TriCon (BW 420) (Sodium tetraborahydrate decahydrate)	1.0 (1 - 1) n1	1.0 (1 - 1) n1		