



Environmental Horticulture Program Research Project Sheet

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

Project Name: Bacterial Disease Efficacy

New	Ongoing	Completed	X	Duration if ongoing or completed:	2006-2012, 2016-2017
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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 (if available):

Abstract from 2018 Bacterial Disease Efficacy Summary

From 2008 to 2017, 72 products were tested through the IR-4 Program as drench or foliar 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.), mancozeb (Dithane, Penncozeb, Protect) and biologicals (Cease, Regalia, Rhapsody and Serenade), provided variable efficacy on these bacterial pathogens. Several new products that are included in the IR-4 Bacterial Efficacy project looked promising based on their efficacy relative to standards. These include Acibenzolar, CG100, Citrex, HM-0736, Kasumin, Regalia, Taegro, Tanos 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</i>	<i>Pseudomonas</i>
<i>Erwinia</i>	<i>Xanthomonas</i>

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

Bolivian Jasmine (<i>Mandevilla boliviensis</i>)	Maple, Japanese (<i>Acer palmatum</i>)
Callery Pear (<i>Pyrus calleryana</i>)	Orchid, Dancing Lady (<i>Oncidium</i> sp.)
Chrysanthemum, Garden	Orchid, Moth (<i>Phalaenopsis</i> sp.)
(<i>Chrysanthemum/Dendranthema</i> sp.)	Ornamental Cabbage, Ornamental Kale (<i>Brassica</i> sp.)
Garden Impatiens (<i>Impatiens walleriana</i>)	Plum (Non-Bearing) (<i>Prunus incisa x campanulata</i>)
Geranium (<i>Pelargonium</i> sp.)	Poinsettia (<i>Euphorbia pulcherrima</i>)
Goldenrod (<i>Solidago</i> sp.)	Rose Mallow (<i>Hibiscus</i> sp.)
Hydrangea, Oakleaf (<i>Hydrangea quercifolia</i>)	Wax Myrtle (<i>Myrica cerifera</i>)
Lavender (<i>Lavandula heterophylla</i>)	Zinnia (<i>Zinnia</i> sp.)
Lilac (<i>Syringa vulgaris</i>)	

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

Actinovate Soluble	BMJ	Citrex
Agrimycin 17	BW165N	Companion
Alexin	Camelot	Copper Count N
Aliette WDG	Canker Kill	CuPro
ASAP	Cease	CuPro 2005
BlightBan A506	CG100	Cuprofix MZ Disperse



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Bloomtime FD	Champ Formula 2F	CuproFix Ultra 40 Disperse
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Target Product(s)Continued		
Flameout	Milsana (now Regalia)	Regalia SC (MOI 106)
Florel	NAI-4201	SP2015
GC Pro (TerraCyte Pro, GreenClean Max)	Nu-Cop 50DF	Taegro
Omega Grow Plus		Tanos
HM-0736 (aka Physpe)	OxiPhos Dithane 75DF Rainshield	TDA02
Inosco	EarthTec	TDA-RTU
Insimmo	Firewall 17WP	Triathlon
Junction (SePro)	Penncozeb DF	TriCon (BW 420)
Kasumin	Phyton-27	USF 0914
Kleengrow	Phyton-27 New Dimension	USF 2018a
Kocide 2000 (Dupont)	Prophytex EC	Vital 4L
Kocide 3000	Prophytex WP	Vitalonil
K-Phite	Protect T/O	ZeroTol
MBI 110	Regalia O5 (MOI-10605)	ZeroTol 2.0

Product Registration and Research Status			
	Fully Screened (also includes standards)	Partially Screened through IR-4 ¹	Need Data Across Species ?
Labeled Generally & Commercialized	Aliette WDG Cease Copper compounds ² Dithane 75DF, Protect DF	KleenGrow Triathlon BA ZeroTol	
Labeled Generally But NOT Commercialized			
Labeled for Specific Diseases & Commercialized		Actinovate Regalia 50 *	Agri-Mycin Alude
Labeled for Specific Diseases but NOT Commercialized			
Not yet registered or Labeled		BlightBan A506 Bloomtime Citrex GC Pro Inosco Insimmo	Kasumin MBI - 110 NAI-4201 TDA 02 Taegro Vacciplant
Agriphage DPZ, Optimum Milstop			
No longer available for development		CG100 Florel Prophytex EC Prophytex WP SP2015	

* 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 Including but not limited to Camelot O, CuPRO, Kocide, Junction, Nu-Cop, Phyton 27

Area	Characteristic	Pro	Con
Availability & effectiveness of alternative management tools	Bacterial disease problems have few optimal control tools	x	
	Multiple years of data screening over 70 products and combinations with not many optimal options arose other than copper-based and mancozeb products were effective generally		x
	Tank mix combinations	x	x
Damage potential of target		X	
Performance and crop safety of proposed products (from other systems)	Acibenzolar efficacy was variable based on pathogen-host system		x
	Phytotoxicity		x
Compatibility with IPM, resistance management programs			
Economics	Important to Growers	x	
Geographic distribution		x	
Manufacturer interest in labeling products	Yes, for the couple new tools identified	x	
Comments: not a high priority project at 2017 workshop.			

IR-4 Efficacy Trials to Date
<p>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.</p> <p>'Labeled' indicates that this disease species or genera is listed on the label. A rating of 2 or lower is considered unacceptable efficacy (<i>red text</i>). 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 <i>green text</i>. For disease/product combinations that are blank, IR-4 has not screened this combination.</p>

FRAC Class	Products (active ingredients)	Registered Use Site(s)	REI	Application Method	Efficacy on Bacterial Species			
					<i>Agrobacterium tumefaciens</i>	<i>Erwinia</i> spp.	<i>Pseudomonas</i> spp.	<i>Xanthomonas</i> spp.
Registered Products								
7 + 3	Postiva (pydiflumetofen + difenoconazole)	TBD	-	S	-	-	E	-
24	Kasumin (kasugamycin)	TBD	12 h	S	P	P-F	P-E	P-G
25	Agrimycin, Firewall (streptomycin sulfate)	N	12 h	S	P	G	-	-
44	Cease, Serenade Optimum, etc. (<i>Bacillus subtilis</i>)	G, I, N, S	4 h	S	-	P-F	P	P-G
	Double Nickel LC, Sentinel, Triathlon (<i>Bacillus amyloliquefaciens</i> strain D747)	G, I, N, S	4 h	S	-	P-F	F	F
BM 01	Regalia (extract of <i>Reynoutria sachalinensis</i>)	G, I, N, S	4 h	S	P	P-F	P-G	P-F
M1	Badge SC, Badge X2 (copper hydroxide + copper oxychloride)	G, N, S	48 h	S	-	-	-	-
	Camelot, Cueva (copper octanoate)	G, I, N, S	4 h	S	-	F-G	E	-
	Champ, Champion, Kentan, Kocide, etc.(copper hydroxide)	G, I, N, S	48 h	S	-	P-E	P-E	P-E
	CUpRO 5000, Kalmor (copper hydroxide)	G, N, S	48 h	S	-	F	E	-
	Copper Count-N (copper ammonium complex)	G, I, N, S	12 h	S	-	-	-	-
	Cuprofix Ultra (copper sulfate)	G, N, S	48 h	S	-	-	-	-
	Nordox (cuprous oxide)	G, I, N, S	24 h	S	-	-	-	-
	Phyton (copper sulfate pentahydrate)	G, I, N	24 h	S	-	-	P-E	P-G
M3	Dithane, Protect, Pentathlon, etc. (mancozeb)	G, N	24 h	S	-	E	P-G	P-E
M1 + M3	Junction (copper hydroxide + mancozeb)	G, N	24 h	S	-	-	G	G-E
P 07	Aliette, Areca (fosetyl Al)	G, N	12 h	S	-	P-F	P-E	F-G
	Alude, Magellan, Vital, etc. (phosphorus acid salts)	G, N	4 h	D S	- -	- -	- -	- -
P 07 + NC	OxiPhos (Mono- and di-potassium salts of phosphorus acid + hydrogen peroxide)	G	4 h	S	-	-	P	F
NC	Kleengrow (Didecyl dimethyl ammonium chloride)	G	48 h	S	-	F-E	P-F	-
	Actinovate (<i>Streptomyces lydicus</i>)	G, L,I,N,S	1 h	D,S	-	E,G	E,G	E,G
	ZeroTol (hydrogen peroxide + peroxyacetic acid)	G, I, N	0 h	S	P	P	P-E	P-G
Experimental Products								
11 + 27	SP2015, Tanos (famoxadone + cymoxanil)*	TBD	12 h	S	-	F	P-F	P-G
BM 01	Citrex (citrus extraction)	TBD	-	S	P	P-F	P-E	P-G
BM 02	BW165N (<i>Ulocladium oudemansii</i> strain U3)	TBD	4h	S	-	-	P	-
	MBI-110 (<i>Bacillus amyloliquifaciens</i> F727)	G, N, S	4 h	S	-	-	F	F
	Prophytex EC (<i>Bacillus subtilis</i> strain B1111)	TBD	4 h	S	-	-	-	F
	Taegro (<i>Bacillus subtilis</i> var. <i>amyloliquefaciens</i>)	TBD	4 h	D S	- -	F P	P P-G	F P-G
P 01	Insimmo (acibenzolar)	TBD	12 h	D	P	G	P	E
				S	P	P-E	P-G	F-E
P 03	NAI-4201 (tiadinil)	TBD	-	D	P	F	P-G	-
				S	-	F	-	-

Information presented is based on the best data available on *September 14, 2021*.

FRAC Class	Products (active ingredients)	Registered Use Site(s)	REI	Application Method	Efficacy on Bacterial Species			
					<i>Agrobacterium tumefaciens</i>	<i>Erwinia</i> spp.	<i>Pseudomonas</i> spp.	<i>Xanthomonas</i> spp.
P 04	Vacciplant, HM-0736 (laminarin)	TBD	4 h	S	P	P-F	P-G	P-G
P 07	Inosco, A14658C (potassium phosphite)	TBD	-	S	-	P	P-F	-
NC	Agriphage (bacteriophage)	TBD	0 h	S	-	-	-	-
NC	BlightBan A506 (<i>Pseudomonas fluorescens</i> A506)	TBD	4 h	S	-	-	G	F
NC	Bloomtime (<i>Pantoea agglomerans</i> strain E325)	TBD		S	-	P-G	G	P-F
NC	MilStop (potassium bicarbonate)	G, I, L, N, S	1 h	S	-	-	-	-
NC	CG100 (caprylic acid)	TBD	-	S	P	P	P-F	P-G
NC	GC Pro (Sodium carbonate peroxyhydrate)	TBD	-	S	-	-	P	F
-	Florel (ethephon)	G, N S	48 h	S	-	P	-	-
-	BW159	TBD						
-	TDA 01 (TDA 01) *	TBD	-	S	-	-	-	G
-	TDA 02 (TDA 02) *	TBD	-	S	-	-	P	-
	TDA-NC							

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

Application Method: D = Drench; S = Spray

Efficacy: E = clearly statistically equivalent or better than untreated non-inoculated and/or clearly statistically different than untreated inoculated; G = statistically different from untreated inoculated and untreated non-inoculated; F = statistically equivalent to both untreated inoculated and untreated non-inoculated; P = statistically equivalent to untreated inoculated. For trials without non-inoculated check, efficacy determined on author's conclusions, % control or comparisons to standard product(s).

Bacterial Efficacy taken from 2018 IR-4 Bacterial efficacy summary and 5 2017 - 2021 PDMR reports.

* No longer available for development in environmental horticulture crops.

updated 9/14/21