

Modes of action (MOAs) of biopesticide active ingredients

Created by Amara Dunn, NYSIPM; last updated 12/9/2022

Important: Any time you use a pesticide, you must read and follow the label directions and comply with all applicable laws and regulations related to pesticide use. Also be sure that any pesticide used is approved for use in your country and state/province. This chart is not meant to replace reading the label. Some MOAs may only apply to certain products containing an active ingredient.

Eat	live microbe grows on/in pest
Poison	biopesticide (or its products) is toxic to and kills the pest directly
Keep out	live microbe grows on plant, leaving no room for pests
Repel (insects)	pest avoids plants treated with biopesticide
Stop (insect) feeding	stops pest from feeding; pest eventually starves
Stop (insect) growth	stops pest from growing or molting; pest eventually dies
Stop (insect) reproduction	hampers pests’ ability to find a mate or produce eggs
Turn on resistance	turns on the plant’s defenses before pest attacks
Grow strong plants	makes plant stronger, healthier, more resilient

BPDB = Bio-Pesticides DataBase form University of Hertfordshire (<http://sitem.herts.ac.uk/aeru/bpdb/index.htm>)

FRAC = Fungicide Resistance Action Committee

IRAC = Insecticide Resistance Action Committee

label = pesticide label

manufacturer lit = promotional or educational materials from pesticide manufacturers

sci lit = studies done at universities

		Pests ¹												
	Sample product name	Diseases	Insects & mites	Nematodes	Eat	Poison	Keep out	Repel (insects)	Stop (insect) feeding	Stop (insect) growth	Inhibit (insect) reproduction	Turn on resistance	Grow strong plants	According to...
<i>Streptomyces lydicus</i> WYEC 108	Actinovate ¹	X				X	X						X	BPDB, EPA, label
polyoxin D zinc salt	Affirm, Oso, Ph-D, Tavano	X				X								EPA
bacteriophages	AgriPhage, etc.	X			X									EPA
<i>Bacillus subtilis</i> strain IAB/BS03	AVIV	X				X	X					X		BPDB, EPA, label, manufacturer lit
azadirachtin	Aza-Direct, AzaGuard, etc.		X					X*	X*	X	X*			EPA, label
<i>Bacillus thuringiensis</i> subsp. <i>galleriae</i> strain SDS-502	beetleGone! TLC		X						X					label
<i>Trichoderma asperellum</i> (ICC 012) & <i>T. gamsii</i> (ICC 080)	Bio-Tam 2.0 ² , Tenet	X				X	X							BPDB, label
<i>Beauveria bassiana</i> strain GHA	BotaniGard, BoteGHA, Mycotrol		X		X									EPA
<i>Aureobasidium pullulans</i> strain DSM 14940 and 14941	Botector	X					X							BPDB, label
<i>Ulocladium oudemansii</i> strain U3	BotryStop	X					X							EPA, label

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<i>Bacillus subtilis</i> strain QST 713	Cease, Serenade, Rhapsody	X				X	X					X	X	BPDB, labels, manufacturer lit
<i>Bacillus subtilis</i> strain GB03 (genetically identical to <i>Bacillus amyloliquefaciens</i> ENV503)	Companion	X					X					X	X	BPBD, EPA, label
<i>Paraconiothyrium minitans</i> strain CON/M/91-08	Contans	X			X									BPDB
<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	DiPel		X			X			X					BPDB, EPA, manufacturer lit
<i>Myrothecium verrucaria</i> strain AARC-0255 - dried fermentation solids & solubles	DiTera DF			X	MOA still unknown									BPDB, EPA
<i>Bacillus amyloliquefaciens</i> D747	Double Nickel	X				X	X					X	X	manufacturer lit
<i>Swinglea glutinosa</i> extract	EcoSwing	X				X						X		FRAC, EPA
Banda de Lupinus albus doce (BLAD) polypeptides	Fracture, Problad Verde	X				X								BPDB
polyhedral occlusion bodies of nuclearpolyhedrovirus of various moths	Gemstar LC		X		X				X					EPA
<i>Chromobacterium subtsugae</i> strain PRAA4-1 (& spent fermentation product) - dead	Grandevo		X			X		X	X		X			EPA, label, manufacturer lit

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Potassium bicarbonate	GreenCure, MilStop	X				X								BPDB
<i>Pseudomonas chlororaphis</i> strain AFS009	Howler, Zio	X				X	X							BPDB, EPA
<i>Bacillus mycoides</i> isolate J	LifeGard WG	X										X		EPA, manufacturer lit
<i>Burkholderia</i> spp. strain A396 (heat killed) ³	Majestene, BioST Nematicide, Venerate		X	X		X				X				EPA, label
<i>Paecilomyces lilacinus</i> strain PL251	MeloCon WG			X	X									BPDB, label
<i>Metarhizium brunneum/anisopliae</i>	Met52		X		X									BPDB, EPA
<i>Streptomyces</i> sp. strain K61	Mycostop, PreFence	X				X	X							BPDB, EPA
<i>Isaria fumosorosea</i> strain Apopka 97	Preferal		X		X									BPDB, EPA
phosphorous acid	Prophyt, K-Phite, etc.	X				X						X		sci lit, label
<i>Gliocladium catenulatum</i> strain J1446	PVent, Prestop	X				X								BPDB, EPA
giant knotweed (<i>Reynoutria sachalinensis</i>) extract	Regalia	X										X	X	BPDB, EPA, sci lit
cerevisane (cell walls of <i>Saccharomyces cerevisiae</i> strain LAS117)	Romeo	X										X		BPDB, label

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<i>Trichoderma harzianum</i> T-22	RootShield	X			X	X	X					X	X	BPDB, manufacturer lit
<i>Trichoderma harzianum</i> T-22 & <i>T. virens</i> strain G-41	RootShield PLUS	X			X	X	X					X	X	EPA, manufacturer lit
<i>Bacillus amyloliquefaciens</i> MBI 600	Serifel	X				X	X					X	X	manufacturer lit
Potassium silicate ⁴	Sil-Matrix	X	X										X (insects & disease)	EPA, manufacturer lit
<i>Gliocladium virens</i> GL-21	SoilGard	X			X	X	X							BPDB
<i>Bacillus pumilus</i> strain QST 2808	Sonata	X				X	X					X		BPDB, EPA
<i>Bacillus amyloliquefaciens</i> strain F727	Stargus, Amplitude	X				X	X					X		EPA, manufacturer lit
<i>Bacillus subtilis</i> var. <i>amyloliquefaciens</i> FZB24	Taegro	X				X	X					X		BPDB, EPA
tea tree oil	Timorex Act, Timorex Gold	X				X						X		BPDB, manufacturer lit, sci lit
clarified hydrophobic extract of neem oil	Trilogy, etc.	X	X			X (insects & disease)								EPA, sci lit
Rhamnolipid biosurfactant (from <i>Psudomonas aeruginosa</i>)	Zonix	X				X								EPA

*MOA may vary among products with this active ingredient

¹ Pests targeted by each active ingredient. Before using any pesticide, you must read the label and ensure that it is permitted for use on the crop, against the pest, and in the setting where you intend to apply it.

² There are several different formulations of Actinovate, for different crops/settings

³ There are two different products called Bio-Tam 2.0 with different EPA reg numbers