BIOLOGICAL CONTROL STRATEGY FOR GREENHOUSE TOMATOES

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BIOLOGICAL CONTROL STRATEGIES FOR GREENHOUSE TOMATOES

The use of biological control agents (BCAs) in greenhouse tomatoes is an excellent resistance management tool and can be used successfully right from the start. BCA's are excellent in preventing pest populations from getting established when they are released early in the crop cycle, ideally during propagation. Continued introductions after planting in the greenhouse is important until the BCA's have established in the crop and are self-sustaining.



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The most common pests that affect greenhouse tomatoes are whitefly, caterpillars/loopers and spider mites. Occasional pests are tomato russet mites, aphids, potato psyllids, and more recently, thrips. *Encarsia formosa*, a small wasp used for whitefly control, has been used since the 1960's, and is therefore one of the first commercially available biocontrol agents for the greenhouse industry.

BIOLINE BIOLOGICAL CONTROL AGENTS FOR GREENHOUSE TOMATOES

DEET	RATE RATE		те	TIMING	COMMENTE	
	BCA	PRODUCT	m2	ft2		
Whitefly, Sweet Potato or Greenhouse	Encarsia formosa	Encarline	1.5 - 6	0.15 – 0.6	Weekly: Start as soon as possible after plants arrive in the greenhouse	Hang Encarline cards between 2nd and 3rd cluster from the top of the plant. Optimal time of <i>Encarsia Formosa</i> is when temps are between 15 and 27 Celsius.
(Trialeurodes vaporariorum and or Bemisia tabaci) Note: In areas where	Eretmocerus eremicus	Eretline	1.5 - 6	0.15 – 0.6	Weekly: Switch from Encarline to Eretline when climate conditions are getting warmer. <i>Eretmocerus</i> does signifinatly more hostfeeding than <i>Encarsia</i>	Optimal introduction method for <i>Eretmocerus</i> is blister packs. Keep blister packs (cards) out of direct sunlight and open release flap on the back. Eretmocerus eremicus optimal temp is >20 celcius (68F)
temperatures are consistently >68F/20C, replace <i>Encarsia formosa</i> with <i>Eretmocerus eremicus</i> . If <i>Bemisia</i> <i>tabaci</i> is present, always use <i>Eretmocerus eremicus</i> as <i>Encarsia</i> <i>formosa</i> is not very effective against this species. For temperate climate zones a mix of both species is available to bridge from cooler to warm climate.	Dicyphus hesperus	Hesperusline	0.15 – 0.6		Minimum of 40 Mullein plants per acre. Start introducing <i>Dicyphus</i> as soon as possible after planting. Feed 4 grams of <i>Ephestia</i> eggs (Bug food) per week during establishment.	Generalist predator - will feed on eggs, larvae, and pupae of whiteflies, along with thrips, moth eggs and various species of mites. However, it is not a stand-alone control for any pest. Always use with parasitoids for whitefly control. Must use mullein banker plants to establish and maintain population.
Caterpillars/loopers (Trichoplusia nii and other	Bacillus thuringiensis		Follow lab	ns	Follow label instructions	Little to no negative affect on other BCAs
species)	Dicyphus hesperus	Hesperusline	0.15 – 0.6		Minimum of 40 Mullein plants per acre. Start introducing <i>Dicyphus</i> as soon as possible after planting. Feed 4 grams of <i>Ephestia</i> eggs (Bug food) per week during establishment.	Control depends on population levels in greenhouse when moths lay eggs. An established population contributes significantly in controlling moth eggs.
Тшо-spotted Spider Mite (<i>Tetranychus urticae</i>) and Carmine mite (<i>Tetranychus</i> <i>cinnabarinus</i>)	Dicyphus hesperus	Hesperusline	0.15 – 0.6		Minimum of 40 Mullein plants per acre. Start introducing <i>Dicyphus</i> as soon as possible after planting. Feed 4 grams of <i>Ephestia</i> eggs (Bug food) per week during establishment.	An established <i>Dicyphus hesperus</i> population can contribute significantly to the control of TSSM.
	Phytoseiulus persimilis	Phytoline	6 to 8	0.6 to 0.8	Start when first TSSM are detected. Repeat weekly until <i>Phytoseiulus</i> is established and mites are controlled.	Early detection improves results. Release <i>Feltiella acarisuga</i> in hotspots. For Carmine mite double release rates.
	Feltiella acarisuga	Feltiline	250 per acre		Minimum of 2 introductions weekly.	
Tomato Russet Mite <i>(Aculops lycopersici)</i>	Amblyseius andersonii	Anderline	One sache stick per p	et on a plant in	Releasing preventatively gives	Effective at slowing down development of TRM in hot spots if released after TRM has been observed. Much more effective when released prior to observing TRM to avoid getting them established.
	Amblyseius californicus	Californiline	sachet per Repeat introducti 4 weeks	n plant	best results.	
	Dicyphus hesperus	Hesperusline	0.15 – 0.6		Minimum of 40 Mullein plants per acre. Start introducing <i>Dicyphus</i> as soon as possible after planting. Feed 4 grams of <i>Ephestia</i> eggs (Bug food) per week during establishment.	An established <i>Dicyphus hesperus</i> population can significantly slow development of TRM.
Aphids (larger spp.)	Aphidius ervi	Erviline	0.5 to 2	0.5 to 0.2	Poloaco at first signs of aphids	
Potato aphid, (Macrosiphum	Aphelinus abdominalis	Apheline	5 to 10	0.5 to 1	for at least 3 weeks or until aphids are controlled.	It is rare to see any other aphid species than Potato aphids in tomato crops.
euphorbiae)	Aphidoletes aphidimyza	Aphidoline	0.5 to 2	0.5 to 0.2		
Thrips: Western Flower Thrips, <i>(Frankliniella</i> occidentalis)	Dicyphus hesperus	Hesperusline	0.15 – 0.6		Minimum of 40 Mullein plants per acre. Start introducing <i>Dicyphus</i> as soon as possible after planting. Feed 4 grams of <i>Ephestia</i> eggs (Bug food) per week during establishment.	Main danger from thrips is virus transmission. If there is a history of thrips in greenhouse, use <i>Dicyphus hesperus</i> , however do not combine with <i>Beauvaria</i> .
	Beauvaria bassiana		Follow lab	oel rate	Follow label rate	
Fungus gnats & Shore flies (Bradysia spp & Scatella spp.) in tomato crops grown in organic or soil media	Stratiolaelaps scimitus (Hypoaspis miles)	Hypoline	100	10	Release as soon as possible after planting out in the greenhouse. If applied during propagation stage,	Apply at planting to the media (soil or other organic growing media) does not do well in Rockwool substrates. Can be mixed and applied together.
	Dalotia coriaria (Atheta coriaria)	Staphyline	2	0.2	second release after planting can be at half rate.	
	Steinernema feltiae & Steinernema carpocapsae	Exhibitline sf Exhibitline sc	250K	25K	Apply to media when levels exceed threshold.	Correct application is critical for efficacy. Make sure solution is agitated, fine filters are removed, and pressure is kept low.