BIOLOGICAL CONTROL STRATEGY FOR GREENHOUSE CUCUMBER PRODUCTION

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BIOLOGICAL CONTROL STRATEGY FOR GREENHOUSE CUCUMBER PRODUCTION

The use of biological control agents (BCA's) in cucumber crops has been used for several decades, and has been very successful. One of the early commercial biocontrol agents, *Phytoseiulus persimilis* to control two spotted spider mite has been used since the 1960's. Long English cucumber plants do not produce pollen, which makes the use of breeding sachets for the *Amblyseius* mites the optimal release method. The use of BCA's is an excellent resistance management tool and can be used very successfully right from the start.

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The most common pests that affect greenhouse cucumber crops are thrips, two spotted spidermites, whiteflies and black melon aphids. Other pest problems that occur are Loopers/Catepillars, lygus and cucumber beetles. BCA's are excellent in preventing pest populations from getting established when they are released early in the crop cycle, ideally during propagation. The use of banker plants can really help to sustain BCA's during the growing season from crop to crop with 3 to 5 crops annually.

BIOLINE BIOLOGICAL CONTROL AGENTS FOR GREENHOUSE CUCUMBERS

PEST	BCA	PRODUCT	RATE m2	RATE ft2	TIMING	COMMENTS
Thrips: Western Flower Thrips, Chili Thrips and other species *(Frankliniella occidentalis, Scirtothrips dorsalis)* Note: during the warmer times of the year, or if both Thrips and Whitefly are present, replace *Amblyseius cucumeris* with *Amblyseius swirskii*	***Amblyseius cucumeris or Amblyseius swirskii***	**Amblyline Stick/ Swirksiline Stick**	1 sachet per plant		At transplanting at propagator.	Communicate with propagator.
		Amblyline/Swirskiline Mini Sachet	1 sachet per 3 or 6 plants		Release either every 2 weeks (1 per 6 plants) or every 4 weeks (1 per 3 plants).	Hang sachet on plant 6 – 8 inches/ 18 to 25 cm from top of the plant.
	Orius insidiosus (Ephestia)	**Oriline i (Bugfood)**	0.5 – 1	0.05 – 0.1	Release 4 consecutive weekly introductions. For optimal establishment and carry over in consecutive crops, ornamental pepper banker plants (Purple flash) are recommended.	NOTE: *Orius* egg laying capacity can be boosted by introducing Bugfood (*Ephestia* eggs) weekly during the first 4 to 6 weeks of establishment at the rate of 4 grams per acre.
			Use a minimum of 80-100 'purple flash' banker plants per acre. Release 2 to 3 orius per plant per week			
Two-spotted spider mites *(Tetranychus urticea)*	***Amblyseius andersoni or Amblyseius californicus***	**Anderline/ Californiline**	4 to 6	0.4 to 0.6	Can be released as broadcast, but better results are achieved with sachets early in start of the crop. Repeated introductions every 2 to 3 weeks.	Little to no negative affect on other BCAs.
			Release one mini sachet per 6 plants early in the crop			
	Phytoseiulus persimilis	**Phytoline**	6 to 8	0.6 to 0.8	Start when first mites are detected. Repeat weekly until *Phytoseiulus* is established and mites are controlled.	Early detection improves results. Some growers use 'control pest release' techniques. Talk to your IPM Technical Specialist for more information.
Whitefly, Sweet Potato or Greenhouse *(Trialeurodes vaporariorum and or Bemisia tabaci)*	***Amblyseius swirskii***	**Swirskiline loose**	100	10	Release once when whitefly has been observed.	Broadcast evenly over leaf canopy.
		Swirskiline Stick - mini sachet	One mini sachet per 3 to 6 plants		Release once when whitefly has been observed.	Hang on sachet 18 to 24 cm (6 to 8 inches) from top of the plants.
	Encarsia formosa & Eretmocerus eremicus	**Encarline - Mix**	3 - 6	0.3 - 6	Start at first signs of whitefly. Release weekly until whitefly is controlled.	Optimal introduction method for wasps is blister packs. Keep blister packs (cards) out of direct sunlight and open release flap on the back.
Note: If *Amblyseius swirskii* is released for whitefly it will also control thrips larvae eliminating the need to release Amblyseius cucumeris. *A. swirskii* requires temperatures >68F for good performance	***Dicyphus hesperus***	**Hesperusline**	3 - 4 Dicyphus per Mullein plant each week for 8 weeks		Minimum of 40 Mullein plants per acre. Start introducing Dicyphus as soon as possible after planting. Feed 4 grams of Ephestia 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. Must use mullein banker plants to establish and maintain population.
Aphids Black Melon *(Aphis gossypii,)* Note: Aphid banker plants are highly effective in cucumber crops.	***Aphidius colemani***	**Aphiline**	0.25 -1	0.025 - 0.1	Release weekly and/or use in combination with aphid banker plants.	Ideal release method is Aphiline in Blister Packs. Hang Blister packs in shady spot out of intense direct sunlight.
	Rhopalosiphum padi	**Boostline - Aphid banker plant**	1 / acre (2.5 / ha) minimum	Apply every other week	Release weekly. Initial introduction is 2 per acre followed by one per acres every 2 weeks.	Consistent releases and maintaining the banker plants are key to the success.
	Aphidoletes aphidimyza	**Aphidoline**	1	0.1	Release at first sign of aphids. Continue weekly releases until control has been achieved.	Be aware of diapause between October 15th and March 1st.
Caterpillars/loopers *(Trichoplusia ni and other species)*	***Podisus maculiventris***	**Podline**	0.05	0.005	Release weekly starting early in the crop until establishment.	If hotspots with loopers occur, focus releases on hotspots. Nymphs develop better in the presence of prey.
	Bacillus thuringiensis		Follow Label instructions.		Little to no negative affect on other BCAs.	*Bacillus thuringiensis*
	Orius insidiosus	**Oriline i**	As per thrips strategy.		An established Orius population can be a significant contributor to looper control as they prey on moth eggs. Focus on aphid control can avoid interference with systemic crop protection products that harm Orius. An interference with such a product typically results in an increase of looper activity within 2 weeks after application.	
Fungus gnats & Shore flies *(Bradysia spp & Scatella spp)* in cucumber crops grown in organic or soil media	***Stratiolaelaps scimitus (Hypoaspis miles)***	**Hypoline**	100	10	Apply at sticking and at transplanting.	If applied at rooting stage, second application should be half rate at transplanting.
	Dalotia coriaria (Atheta coriaria)	**Staphyline**	2	0.2		
	Steinernema feltiae & Steinernema carpocapsae	**Exhibitline sf Exhibitline sc**	250K	25K	Apply at sticking and repeattwice during rooting stage. Reapply immediately after transplanting.	Correct application is critical for efficacy. Make sure solution is agitated, fine filters are removed and pressure is kept low.

Note: Unfortunately at this time there are no bio-control solutions available for *Lygus spp* and Cucumber Beetles. However, there are clear indications from field experiences that the presence of generalist predators such as Orius insidiosus and Dicyphus hesperus established in a cucumber crop seems to have an effect on the presence of Lygus and cucumber beetles. It is therefore recommended to use all 3 banker systems in cucumber crop settings to reduce the risk to have to interfere with traditional pesticide products.

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