



Biological Control Agents (BCAs): Greenhouse Cucumber Insect Management

BCA Insect Control					
Pest	BCA	Rate (Units/m ²)	Rate (Units/ft ²)	Release strategy	Application Notes
Thrips Western flower thrips <i>(Frankliniella occidentalis)</i> ; Chili thrips <i>(Scirtothrips dorsalis)</i> ; and other species	<i>Amblyseius cucumeris</i> or <i>A. swirskii</i> *	1 sachet per plant at propagation, then 1 sachet per 3 plants		Sachets are preferred release method and give consistently more mites per plant. For loose broadcasting during propagation, start at germination and repeat weekly.	After plants are established, hang sachet 6 – 8 inches from the top of every 3 plants. An introduction every 4 weeks is recommended. *Replace with <i>A. swirskii</i> in areas where temperatures are consistently over 75 °F (24 °C) OR when whitefly is found.
		100 when loose	10 when loose		
	<i>Orius insidiosus</i>	0.25 – 0.5	0.025 – 0.05	Release preferably in hot spots or use pepper banker plants at 80-100 per acre.	Introduce minimum 4 weeks in a row starting at the end of February to avoid diapause. Apply supplemental food of <i>Ephestia</i> eggs which can help to increase egg laying capacity on banker plants. Otherwise introduce weekly as needed.
	<i>Stratiolaelaps scimitus</i> (<i>Hypoaspis miles</i>)	100	10	Release first on the organic substrate during propagation and repeat after planting to other containers containing organic material.	Release full rate during propagation. Release half rate after planting if full rate is used during propagation. Both species can be mixed and applied together. (Does not work in rockwool media.)
	<i>Dalotia</i> (=Atheta) <i>coriaria</i>	2	0.2		
	<i>Steinernema feltiae</i> (NemaShield)	250K - 300K	25K - 30K	Bi-weekly applications are recommended at the beginning of the crop.	Initiate treatments during the seedling stage. Keep suspension under constant agitation, remove filters and keep low pressure for better results. (Does not work in Rockwool media.)



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Aphids (small species) Cotton/Melon aphid (<i>Aphis gossypii</i>)	<i>Aphidius colemani</i>	0.25 -1	0.025 -0.1	Release weekly or minimum of 4-5 weekly releases in combination with aphid banker plants.	Mummies typically start to show 2 to 3 weeks after initial release. With banker plants, do not stop weekly introductions until first mummies are hatching on initial banker plants.
	<i>Aphidoletes aphidimyza</i> ¹	1	0.1	Weekly releases upon aphid detection. Continue until control has been achieved.	Start at first sign of aphid presence. Diapause occurs between October and early March. ² Keep carrier lightly humid to ensure <i>A. aphidimyza</i> emergence.
	<i>Chrysoperla spp. larvae</i>	10-50	1-5	Release weekly on hot spots during episodes of high aphid pressure.	Best for quick knock-down effect in hot spots.
	Aphid Banker Plants (<i>Aphidius colemani</i> + <i>Rhopalosiphum padi</i>)	2.5 plants/ ha or 1 plant/acre		Start banker plant strategy as early as possible, before aphids are detected in the crop. Add new banker plants on a bi-weekly basis.	Aphid banker plants are very effective in cucumber crops. The initial introduction should be 2 times the recommended amount.
Two-spotted spider mite (<i>Tetranychus urticae</i>)	<i>Phytoseiulus persimilis</i>	8 - 10	0.8 - 1	Release upon detection of first spider mite spots.	Repeat every week until achieving control; minimum of 4 consecutive weeks.
	<i>Amblyseius (=Neoseiulus) fallacis</i>	4 – 6	0.4 – 0.6	Start releasing from crop propagation stage.	This species is compatible with other spider mites' predators like <i>P. persimilis</i> .
	<i>Amblyseius andersoni</i> / <i>A. californicus</i>			Release with sachets, 1 per 6 plants, or loose at the start of the crop.	Repeat sachet introductions every 4 weeks. Continue release weekly for 2-3 weeks for loose applications.



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Whiteflies Greenhouse whitefly (<i>Trialeurodes vaporariorum</i>); Sweet Potato Whitefly (<i>Bemisia tabaci</i>)	<i>Amblyseius swirskii</i>	1 sachet per plant at propagation then 1 per 3 plants		Sachets are preferred release method and give consistently more mites per plant. For loose broadcasting during propagation, start at germination and repeat weekly.	Release evenly in the area or apply with a battery-operated blower. Note: Will also control thrips larvae but requires temperatures >68 °F for best results.
		100 when loose	10 when loose		
	<i>Encarsia formosa</i>	3 – 6	0.3 – 0.6	Start releasing after first whiteflies are detected and continue weekly.	Maintain releases every week until achieving control. A combination of both species can be used for better results. Note: <i>Encarsia</i> is not effective for controlling <i>Bemisia tabaci</i> .
	<i>Eretmocerus eremicus</i>				
	<i>Dicyphus hesperus</i>	3-4 per Mullein plant per week for 8 weeks		Introduce Mullein plants at 40 per acre. Apply <i>Ephestia</i> eggs weekly during establishment.	This generalist predator feeds on eggs, larvae, and pupae of whitefly. Also feeds on aphids, thrips, moth eggs and various species of mites.
Lepidopterans Cabbage looper (<i>Trichoplusia ni</i>) and other species	<i>Podisus maculiventris</i>	0.05	0.005	Start releases immediately at first signs of moths or loopers.	Keep up weekly introductions to ensure establishment. Concentrate releases on lepidopteran hot spots as this benefits <i>Podisus</i> nymph development.
	<i>Orius insidiosus</i>	Same as for thrips control			Only effective in a proactive system with banker plants. Population needs to be established to be effective (curative releases will not be effective).
	<i>Dicyphus hesperus</i>	Same as for whitefly control			



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Fungus gnats (<i>Bradysia</i> spp.) and Shore flies (<i>Scatella</i> spp.)	<i>Stratiolaelaps scimitus</i> (= <i>Hypoaspis miles</i>)	100	10	Release on top of organic growing media at propagation and repeat if planting to other containers containing organic material.	Release full rate during propagation. Release half rate after planting if full rate is used during propagation. Both species can be mixed and applied together. (Does not work in rockwool growing media.)
	<i>Dalotia coriaria</i> (= <i>Atheta coriaria</i>)	2	0.2		
	<i>Steinernema feltiae</i> (NemaShield)	250K - 300K	25K - 30K	Apply bi-weekly from the beginning of the crop.	Initiate treatments during the seedling stage. Keep suspension under constant agitation, remove filters and keep low pressure for better results. (Does not work in rockwool media.)

NOTES:

¹ *Aphidoletes aphidimyza* is highly susceptible to the use of any sulfur products; sulfur should be avoided when using this species.

² *Aphidoletes* and *Feltiella* both mate at dusk. If lights are utilized in the greenhouse, it is better to allow the natural sunset, and wait to turn on lights later, at 2 or 3 am. To avoid diapause (between October and early March), extend daylength to 12 hours.

Cucumber beetle and Lygus bug can also be problem pests in Cucumber production. Currently there are no known specific BCA's for controlling these pests. Practical experience has shown that established populations of generalist predators such as *Orius*, *Dicyphus* and *Podisus* will help to maintain these pest problems below threshold levels.

Contact your Biological Control Advisor for additional information.