

BIOLOGICAL CONTROL STRATEGY FOR INDOOR, GREENHOUSE AND OUTDOOR CANNABIS PRODUCTION (INCLUDING PROPAGATION)



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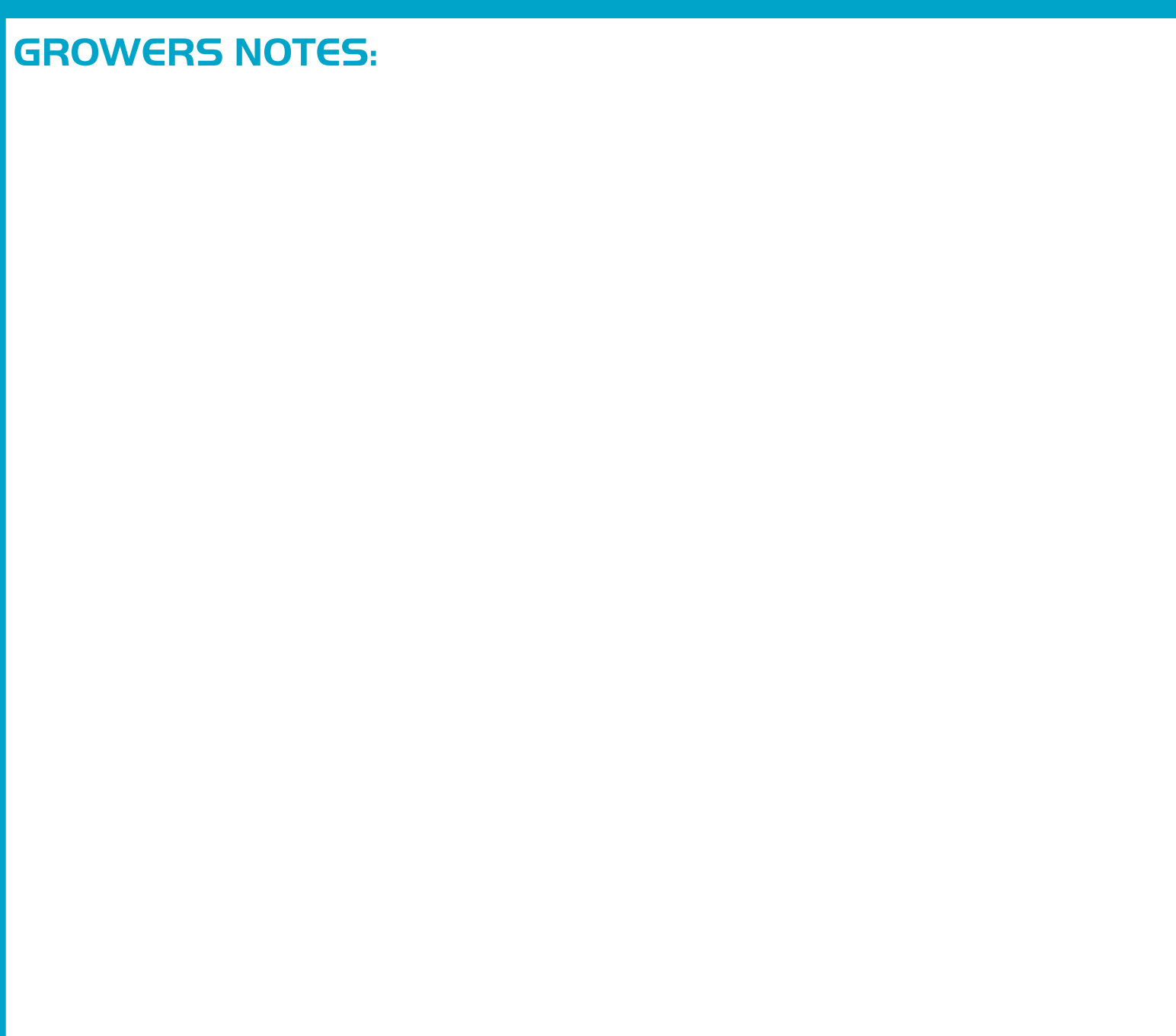
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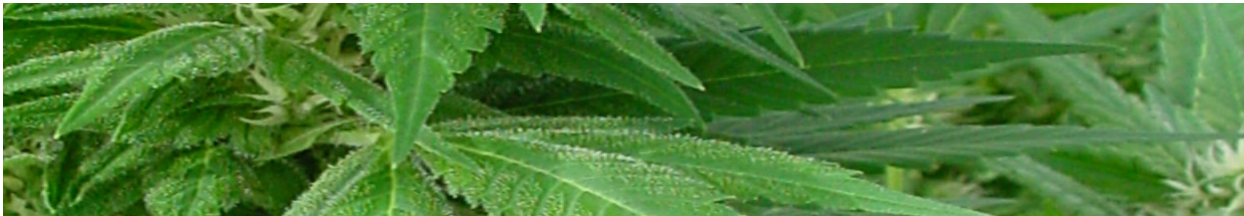
BIOLOGICAL CONTROL STRATEGY FOR INDOOR, GREENHOUSE AND OUTDOOR CANNABIS PRODUCTION (INCLUDING PROPAGATION)

GROWERS NOTES:



BIOLOGICAL CONTROL STRATEGY FOR INDOOR, GREENHOUSE AND OUTDOOR CANNABIS PRODUCTION (INCLUDING PROPAGATION)

The use of biological control agents (BCAs) in cannabis crops is due to growers being able to meet consumer demand for pesticide free product. The use of BCA's is very successful when used 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.





BIOLOGICAL CONTROL STRATEGY FOR INDOOR, GREENHOUSE AND OUTDOOR CANNABIS PRODUCTION (INCLUDING PROPAGATION)

The most common pests that affect cannabis crops are mites; but thrips, aphids, and whitefly can also be problematic. The use of BCA's is very successful when used 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.

BIOLINE BIOLOGICAL CONTROL AGENTS FOR INDOOR, GREENHOUSE & OUTDOOR CANNABIS

PEST	BCA	PRODUCT	RATE		TIMING	COMMENTS
			m2	ft2		
Two-spotted spider mites (<i>Tetranychus urticae</i>)	<i>Amblyseius andersoni</i>	Anderline	4 - 6	0.4 - 0.6	Release in propagation.	Can be mixed application with <i>Amblyseius cucumeris</i> in propagation.
	<i>Phytoseiulus persimilis</i>	Phytoline	8 - 10	0.8 - 1	Start when first mites are detected. Repeat weekly until Phytoseiulus is established and mites are controlled.	Early detection improves results. Consider using indicator plants (bush beans).
Broad Mites (<i>Polyphagotarsonemus latus</i>)	<i>Amblyseius cucumeris</i>	Amblyline Stick - Mini Sachet	1 sachet per propagation tray or per plant.		Place sachet at sticking and upon transplanting into pots. Later on hang mini on plant.	Sachets typically release between 4 and 6 weeks, but we recommend adding another introduction every 4 weeks.
Hemp russet mites (<i>Aculops cannabicola</i>)	<i>Amblyseius andersoni</i>	Anderline Stick or Mini	1 sachet per propagation tray or per plant.		Place sachet at sticking and upon transplanting into pots. Later on hang mini on plant.	Sachets typically release between 4 and 6 weeks, but it is recommended to add another introduction every 4 weeks.
	<i>Amblyseius andersoni</i>	Anderline	4 - 6	0.4 - 0.6	Release in propagation.	Can be mixed application with <i>Amblyseius cucumeris</i> in propagation.
Thrips: Western Flower Thrips, Chili Thrips and other species (<i>Frankliniella occidentalis</i> , <i>Scirtothrips dorsalis</i>) Note: In areas where temperatures are consistently >75F/24C, replace <i>Amblyseius cucumeris</i> with <i>Amblyseius swirskii</i>	<i>Amblyseius cucumeris</i>	Amblyline Stick	1 sachet per plant		At transplanting at propagator.	Sachets typically release mites between 4 and 6 weeks, but it is recommended to add another introduction every 4 weeks.
		Amblyline Mini Sachet	1 per plant or no fewer than 1 every other plant if you are using both <i>A. cucumeris</i> and <i>A. andersonii</i> alternating plants.		Hang sachet on plant 6 – 8 inches/ 18 to 25 cm (6 to 8 inches) from top of the plant.	
	<i>Stratiolaelaps scimitus</i> (<i>Hypoaspis miles</i>)	Hypoline	100	10	Apply at sticking/seeding and at transplanting.	If applied at rooting stage, second application should be half rate at transplanting.
	<i>Dalotia coriaria</i> (<i>Atheta coriaria</i>)	Staphyline	2	0.2		
	<i>Orius insidiosus</i>	Oriline i	0.25 – 0.5	0.025 – 0.05	Release 4 consecutive weekly introductions starting at end of February under natural day length.	Earlier releases can be as done as long as day length is increased with supplemental lighting for more then 12 hours to avoid diapause.
Fungus gnats & Shore flies (<i>Bradysia spp</i> & <i>Scatella spp</i>) in tomato crops grown in organic or soil media	<i>Stratiolaelaps scimitus</i> (<i>Hypoaspis miles</i>)	Hypoline	100	10	Apply at sticking and at transplanting.	If applied at rooting stage, second application should be half rate at transplanting.
	<i>Dalotia coriaria</i> (<i>Atheta coriaria</i>)	Staphyline	2	0.2		
	<i>steinernema feltiae</i> & <i>Steinernema carpocapsae</i>	Exhibitline sf Exhibitline sc	250K	25K	Apply at sticking and repeat twice during rooting stage. Reapply after transplanting.	Correct application is critical for efficacy. Make sure solution is agitated, fine filters are removed and pressure is kept low.
Aphids (small spp), Green Peach, Black Melon, Tobacco aphid (<i>Aphis gossypii</i> , <i>Myzus persicae</i> , <i>Myzus nicotianae</i>)	<i>Aphidius colemani</i>	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.
	<i>Rhopalosiphum padi</i>	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 acre every 2 weeks.	
	<i>Aphidoletes aphidimyza</i>	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. Not recommended in indoor facilities due to mating problems.
Aphids (larger spp) Potato aphid, Fox glove aphid (<i>Macrosiphum euphorbiae</i> , <i>Aulacorthum solani</i>)	<i>Aphidius ervi</i>	Erviline	0.5 to 2	0.5 to 0.2	Release weekly before aphids become a problem.	
	<i>Aphidoletes aphidimyza</i>	Aphidoline	1	0.1	Release at first signs of aphids for at least 3 weeks or until aphids are controlled.	Be aware of Diapause between October 15th and March 1st. Not recommended in indoor facilities due to mating problems
Aphids (root infesting) Root aphid (<i>Phemigus sp.</i>) and Phylloxera (<i>Phylloxera sp.</i>)	<i>Beauveria bassiana</i>	BotaniGard22WP™ Mycotrol™	N/A	N/A	Apply at first signs of aphids. Soak pot (preferred) or drench pots. Repeat every 3-5 days for 3 total applications.	See Bioworks http://www.bioworks.com for more information on using their product. They have a root aphid control sheet.
Whitefly, Sweet Potato or Greenhouse (<i>Trialeurodes vaporariorum</i> and or <i>Bemisia tabaci</i>) Note: If <i>Amblyseius swirskii</i> is released for whitefly it will also control thrips larva eliminating the need to release <i>Amblyseius cucumeris</i> . <i>A. swirskii</i> requires temperatures >68F (20C) for good performance	<i>Amblyseius swirskii</i>	Swirskiline– loose	100	10	Apply weekly during propagation.	Broadcast evenly or use a battery-operated blower.
		Swirskiline Stick - mini sachet	1 sachet per 3 plants if plants are touching. If not, continue with 1 sachet per plant.		Place sachet at sticking of cuttings and again when transplanting into pots. Once plants are full grown use mini sachet with hanger	Sachets typically release mites between 4 and 6 weeks, but it is recommended to add another introduction every 4 weeks.
	<i>Encarsia formosa</i> & <i>Eretmocerus eremicus</i>	Encarline - Mix	3 - 6	0.3 to 6	Start at first signs of whitefly Releases weekly until whitefly is controlled for good performance.	Optimal introduction method for wasps is blister packs. Keep blister packs (cards) out of direct sunlight and open release flap on the back