Biological Control Agents (BCAs): Cannabis Insect Management

BCA Insect Control					
Pest	**BCA**	**Rate (m^2)**	**Rate (ft^2)**	**Release Strategy**	**Application Notes**
Root aphids: (*Rhopalosiphum rufiabdominalis*, *Pemphigus* spp.)	*Beauveria bassiana* (BotaniGard 22 WP, Mycotrol WPO)	1-2 lbs / 100 gal	250-500g / 400 L	Start at first sign of root aphid infestation.	Use 2 lbs/100 gal (2 Tbsp/1 gal) applied 2-3 times, 3-5 days apart. Apply 1 lb/100 gal every 7-10 days once population level is under control.
Aphids (small species): Green peach aphid *(Myzus persicae)*; Cotton/Melon aphid (*Aphis gossypii*); Bean aphid (*Aphis fabae*)	*Aphidius colemani*	0.25 - 1.0	0.025 - 0.1	Release weekly or minimum of 4-5 weekly releases in combination with aphid banker plants.	Adults can be sensitive to foliar treatments, wait at least 1-2 days to release them if a product has been applied.
	A. matricariae	0.5 – 2.0	0.05 - 0.2		
	Aphelinus abdominalis	0.5 – 2.0	0.05 - 0.2	Alternate releases with *Aphidius* spp.	Release this species when low parasitism is achieved with *A. colemani* and *A. matricariae* or if hyperparasitism is confirmed on aphid populations.
	Aphidoletes aphidimyza	1.0	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. Keep carrier lightly humid to ensure *A. aphidimyza* emergence.
	Chrysoperla spp.	10-50	1-5	Release weekly during episodes of high aphid pressure	Best for quick knock-down effect in hot spots.
	Aphid Banker Plants (*Aphidius colemani – Rhopalosiphum padi*)	2.5 plants / ha	1 plant / acre	Start banker plant strategy as early as possible, before aphids are detected in the crop.	Start with 2 plants/acre. Add 1 new plant/acre on a bi-weekly basis.

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Aphids (large species): Cannabis aphid (*Phorodon cannabis*); Dandelion aphid (*Abstrusomyzus phloxae);* Potato aphid (*Macrosiphum euphorbiae*); Fox glove aphid (*Aulacorthum solani*)	*Aphidius ervi*	0.25 – 1.0	0.025 - 0.1	Release on a weekly basis	Use *A. ervi* as a complementary strategy when large aphid species are detected in the crop.
	Aphelinus abdominalis	0.5 – 2.0	0.05 – 0.2	Alternate releases with *Aphidius* spp.	Release this species when low parasitism is achieved with *A. ervi* or if hyper-parasitism is confirmed on aphid populations.
	Aphidoletes aphidimyza	1.0	0.1	Weekly releases upon aphid detection. Continue until control has been achieved	Start at first sign of aphid presence. Keep carrier lightly humid to ensure *A. aphidimyza* emergence.
	Chrysoperla spp.	10 - 50	1-5	Release weekly during episodes of high aphid pressure	Best for quick knock-down effect in hot spots.
Two-spotted spider mite: (*Tetranychus urticae*)	*Phytoseiulus persimilis*	8 - 10	0.8 – 1.0	Release upon detection of first spider mite spots	Repeat every week until achieving control. The use of indicator plants (bush beans) provides a good idea of pest control.
	Amblyseius (=Neoseiulus) fallacis	4 - 6	0.4 – 0.6	Start releasing from crop propagation stage.	This species is compatible with other spider mite predators like *P. persimilis*.
Hemp russet mite: (*Aculops cannabicola*)	*Amblyseius andersoni*	1 sachet per tray, then 1 sachet per plant		Release every 4 weeks for better results. Start from crop propagation stage.	Hang sachet 6 – 8 inches from the top of the plant.
	Amblyseius andersoni	4 - 6	0.4 – 0.6		This species can be release alone or in combination with *A. cucumeris*
Broad Mite: (*Polyphagotarsonemus latus*)	*Amblyseius cucumeris*	1 sachet per tray, then 1 sachet per plant		Introduce sachets at sticking and transplanting. Hang sachets on plants afterwards.	Renew sachets preferably every 4 weeks

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Thrips: Western flower thrips (*Frankliniella occidentalis);* Chili thrips *(Scirtothrips dorsalis*)	*Amblyseius cucumeris*	1 sachet per tray, then 1 sachet per plant		Sachets are the preferred release method, providing consistently more mites per plant. For loose material broadcasting, start releasing at propagation and repeat weekly.	Stick sachet at base of the plant or hang sachet 6 – 8 inches from the top of the plant. An introduction every 4 weeks is recommended. Replace with *A. swirskii* in areas where temperatures are consistently over 75 °F (24 °C)
		100 when loose	10 when loose		
	Orius insidiosus	0.25 – 0.5	0.025 – 0.05	Release preferably in hot spots	Introduce 4 weeks in a row at the end of February to avoid diapause
	Stratiolaelaps scimitus (Hypoaspis miles)	100	10	Release first on the substrate during propagation and repeat when transplanting to other containers.	Release full rate during propagation. Release half rate after transplanting if full rate is used during propagation. It may require several introductions in hydroponic crops. Both species can be mixed and applied together.
	Dalotia coriaria (=*Atheta coriaria*)	2	0.2		
	Steinernema feltiae (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.
Whiteflies: Sweet potato whitefly (*Bemisia tabaci)*; Greenhouse whitefly (*Trialeurodes vaporariorum*)	*Amblyseius swirskii*	1 sachet per tray, then 1 sachet per plant		For loose material, start releasing at propagation and repeat when transplanting.	Release evenly in the area or apply with a battery-operated blower
		100 when loose	10 when loose		
	Encarsia formosa	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
	Eretmocerus eremicus	3 - 6	0.3 – 0.6		

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Fungus gnats: (*Bradysia* spp.; shore flies (*Scatella* spp.)	*Stratiolaelaps scimitus (=Hypoaspis miles)*	100	10	Release on top of growing mix at propagation and repeat when transplanting to other containers	Release full rate during propagation. Release half rate after transplanting if full rate is used during propagation. It may require several introductions in hydroponic crops. Both species can be mixed and applied together.
	Dalotia coriaria (=*Atheta coriaria*)	2	0.2		
	Steinernema feltiae (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.

Refer to our guide on "Utilizing Dips: Clean up incoming plant material" for more details on how to use some of our other products to reduce the risks of 'hitch hikers' on your young plant material coming in through the door. Contact your Biological Control Advisor for additional information.

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