



## Biological Control Agents and Use With BioWorks Products

BotaniGard® 22WP, Mycotrol® WPO, CEASE®, MilStop®, Molt-X®,  
RootShield®/RootShield® PLUS, SuffOil-X®

The introduction of Biological Control Agents (BCAs) is often a component of an Integrated Pest Management (IPM) program and an awareness of use with BioWorks products is essential to the success of the program.

**BotaniGard 22 WP\*** and **Mycotrol WPO\*** – Effective biological insecticides that are used to control many insects and are based on the highly successful fungus, *Beauveria bassiana* strain GHA. The applied spores infect the soft body of an insect directly. Consequently, growers need to be able to assess how they can be used in their IPM program, for example, as a spot treatment or by broad application.

Biological Control Agents and their use with BotaniGard 22WP and Mycotrol WPO Foliar Sprays		
Genus	Species	BioWorks Recommendation
<i>Aphidius</i>	<i>colemani</i>	Ok on mummies. Some reduction of adult population. Wait until mummification is extensive before applying. Avoid application to banker plants.
<i>Aphidius</i>	<i>ervi</i>	Ok on mummies. Some reduction of adult population. Wait until mummification is extensive before applying. Avoid banker plants.
<i>Aphidoletes</i>	<i>aphidimyza</i>	Use only with high population. Expect reduction after application. Re-introduce after application.
<i>Bombus</i>	spp.	Ok---Close the hive before application
<i>Chrysoperla</i>	<i>rufilabris</i>	Apply 5 days prior to release
<i>Cryptolaemus</i>	<i>montrouzieri</i>	Ok to apply Expect reduction after application.
<i>Dalotia (Orius)</i>	<i>insidiosus</i>	Apply prior to introduction of <i>Dalotia</i>
<i>Diglyphus</i>	<i>isaea</i>	Ok to Apply ---Wait for a population of adults to build. Expect some reduction
<i>Encarsia</i>	<i>formosa</i>	Ok with parasitized pupae. Expect reduction of wasps after application.



**Biological Control Agents and their use with  
BotaniGard 22WP and Mycotrol WPO Foliar Sprays (continued)**

Genus	Species	BioWorks Recommendation
<i>Eretmocerus</i>	<i>californicus</i>	Ok with parasitized pupae. Expect reduction of wasps after application.
<i>Eretmocerus</i>	<i>eremicus</i>	Use only with high population of parasite
<i>Feltiella</i>	<i>acarisuga</i>	
<i>Stratiolaelaps scimitus</i> ( <i>Hypoaspis miles</i> )	<i>scimitus</i>	Ok to Apply
<i>Amblyseius</i> ( <i>Neoseiulus</i> )	<i>californicus</i>	Ok to Apply
<i>Amblyseius</i> ( <i>Neoseiulus</i> )	<i>cucumeris</i>	Ok to Apply
<i>Neoseiulus</i> ( <i>Amblyseius</i> )	<i>fallacis</i>	Ok to Apply
<i>Phytoseiulus</i>	<i>persimilis</i>	Apply 5 days prior to release
<i>Rhopalosiphum</i>	<i>padi</i>	DO NOT APPLY TO BANKER PLANTS
<i>Steinernema</i>	<i>carpocapsae</i>	Ok to Apply
<i>Steinernema</i>	<i>feltiae</i>	Ok to Apply
<i>Trichogramma</i>	spp.	Ok to Apply



**Molt-X** – An emulsifiable concentrate with 3% azadirachtin active ingredient derived from the seeds of the neem tree. As an Insect Growth Regulator (IGR), it interferes with the key molting hormone, ecdysone, preventing insects from progressing from one life stage to the next. Please refer to product label for proper application.

Biological Control Agents and their use with Molt-X						
Genus	Species	BioWorks Recommendation	Applied Bio-nomics Recommendation	Koppert Rating (See Chart Below)	Biobest Toxicity Rating (See Chart Below)	Bioline Comments
<i>Amblyseius</i>	<i>californicus</i>	N/A	N/A	N/A	Nymph = 1 Adult = 1	Nymph = 1 Adult = 1
<i>Amblyseius</i>	<i>cucumeris</i>	N/A	Ok to apply	N/A	Nymph = 1 Adult = 1	Nymph = 1 Adult = 1
<i>Amblyseius</i>	<i>degenerans</i>	N/A	N/A	Nymph = 1 Adult = 1	Nymph = 1 Adult = 1	N/A
<i>Amblyseius</i>	<i>fallacis</i>	Ok to apply	Ok to apply	N/A	N/A	N/A
<i>Amblyseius</i>	<i>limonicus</i>	N/A	N/A	Population = 1	N/A	N/A
<i>Amblyseius</i>	<i>swirskii</i>	N/A	N/A	Population = 2 Adult = 1	Nymph = 2 Adult = 2	Nymph = 2 Adult = 2
<i>Aphidius</i>	<i>colemani</i>	N/A	N/A	Adult = 1	Larva = 1 Adult = 1	Larva = 1 Adult = 1
<i>Aphidius</i>	<i>ervi</i>	N/A	N/A	Adult = 1	Larva = 1 Adult = 1	Larva = 1 Adult = 1
<i>Anthocoris</i>	<i>nemaoralis</i>	N/A	N/A	N/A	Nymph = 1 Adult = 1	Nymph = 1 Adult = 1
<i>Aphidoletes</i>	<i>aphidimyza</i>	OK to Apply	OK to Apply	N/A	Larva = 1 Adult = 1	Larva = 1 Adult = 1
<i>Bombus</i>	spp.	N/A	N/A	OK - Close the hive before application	Close the hive before application	N/A
<i>Chrysoperla (Chrysopa)</i>	spp.	OK to Apply	N/A	Larva = 1	Larva = 1 Adults = 1	Larva = 1 Adult = 1
<i>Coleoptera</i>	spp.	N/A	N/A	N/A	Larva = 2 Adult = 1	Larva = 2 Adult = 1
<i>Cryptolaimus</i>	<i>momtrouzieri</i>	OK to Apply	N/A	N/A	N/A	N/A
<i>Delphastus</i>	<i>pusillus</i>	OK to Apply	N/A	Larva = 1	N/A	N/A
<i>Diglyphus</i>	<i>Isaea</i>	N/A	N/A	Adult = 3	Larva = 1 Adult = 1	Larva = 1 Adult = 1
<i>Dacnusa</i>	<i>Sibirica</i>	N/A	N/A	N/A	Larva = 1 Adult = 1	N/A
<i>Eretmocerus</i>	spp.	N/A	N/A	N/A	Larva = 1 Adult = 1	Larva = 1 Adult = 1



### Biological Control Agents and their use with Molt-X (continued)

Genus	Species	BioWorks Recommendation	Applied Bio-nomics Recommendation	Koppert Rating (See Chart Below)	Biobest Toxicity Rating (See Chart Below)	Bioline Comments
<i>Encarsia</i>	<i>formosa</i>	N/A	N/A	Pupa = 1 Adult = 3	Larva = 1 Adult = 2	Larva = 1 Adult = 2
<i>Feltiella</i>	<i>acarisuga</i>	N/A	N/A	Larva = 1 Adult = 1	Larva = 1 Adult = 2	Larva = 1 Adult = 2
<i>Hypoaspis (Stratiolaelaps scimitus)</i>	<i>miles</i>	N/A	N/A	N/A	Larva = 1 Adult = 2	Larva = 1 Adult = 2
<i>Heterorhabditis</i>	<i>bacteriophora</i>	N/A	N/A	Larva = 1	N/A	N/A
<i>Heterorhabditis</i>	<i>megidis</i>	N/A	N/A	Larva = 1	N/A	N/A
<i>Macrolophus</i>	<i>caliginosus</i>	N/A	N/A	Nymph = 2 Adult = 3	N/A	N/A
<i>Orius</i>	<i>insidiosus</i>	N/A	N/A	Adult = 1	N/A	N/A
<i>Orius</i>	<i>laevigatus</i>	N/A	N/A	Nymph = 1 Adult = 1	N/A	N/A
<i>Orius</i>	<i>majusculus</i>	N/A	N/A	Adult = 1	N/A	N/A
<i>Orius</i>	<i>spp.</i>	N/A	N/A	Adult = 1	Larva = 2 Adult = 1	Larva = 2 Adult = 1
<i>Phytoseiulus</i>	<i>persimilis</i>	N/A	N/A	Egg = 1 Nymph = 1 Adult = 1	Larva = 2 Adult = 2	Larva = 2 Adult = 1
<i>Steinernema</i>	<i>feltiae</i>	OK to Apply	N/A	Larva = 1	N/A	N/A

### Toxicity Rating Chart

Rating	Mortality / Reduction	Koppert Legend for Side Effects Guide	Biobest Legend for Side Effects Manual	Bioline Legend
1	<25%	Harmless	Non-Toxic	Low Impact
2	25-50%	Slightly Harmful	Slightly Toxic	Slight Impact
3	50-75%	Moderately Harmful	Moderately Toxic	Moderate Impact
4	>75%	Very Harmful	Toxic	Not Advised

Koppert Resource: <http://side-effects.koppert.nl/>

Biobest Resource: <http://www.biobestgroup.com/en/side-effect-manual>

Applied Bio-nomics: <http://www.appliedbio-nomics.com/>



**CEASE\*\*** – Used for controlling a wide array of both fungal and bacterial pathogens, while providing outstanding plant and environmental safety. Based on a naturally occurring, patented strain of *Bacillus subtilis* (strain QST 713), CEASE can be used as a foliar spray and soil drench on vegetables grown under cover. Please refer to product label for proper application.

### Biological Control Agents and their use with CEASE

Genus	Species	BioWorks Recommendation	Bioline Comment
<i>Amblyseius</i> ( <i>Typhlodromips</i> )	<i>swirskii</i>	Ok to apply	Ok to apply
<i>Aphidius</i>	<i>colemani</i>	Ok to apply	Ok to apply
<i>Bombus</i>	spp.	Ok to apply	Ok to apply
<i>Gratiana</i>	<i>boliviana</i>	Ok to apply	Ok to apply
<i>Orius</i>	<i>insidiosus</i>	Ok to apply	Ok to apply
<i>Orius</i>	<i>laevigatus</i>	Ok to apply	Ok to apply
<i>Phytoseiulus</i>	<i>persimilis</i>	Ok to apply	Ok to apply

**RootShield/RootShield PLUS** – The RootShield family of products is used to prevent the development of root diseases causing damping off. They will not interfere with the introduction of BCAs inhabiting the soil/growing mix.

**SuffOil-X** – A light horticultural oil used to control insects, along with providing suppression of certain foliar diseases. It is expected that it will harm beneficials, but due to the lack of residue after application, populations can rebuild. Releases can occur after 24 hours from SuffOil-X application. This product becomes very useful in an IPM program for spot treatment of insects.

**MilStop\*\*** – A water soluble, broad spectrum, foliar fungicide. The active ingredient is potassium bicarbonate and is known to have a detrimental effect on soft bodied insects. For hard bodied insects apply no later than two days prior to release. Please refer to product label for proper application.

\*\*Resources were reviewed for the compatibility of MilStop and the Cease active ingredient with BCAs and a summary of the findings is provided. Please refer to product label for proper application and your BCA supplier for further information.

**NOTE:** For non-BioWorks products, we do not endorse or recommend any particular products, treatments, services or diagnoses, whether specifically or generally, and professional advice should be sought in relation to all treatment decisions. We provide information and listings only which we hope is helpful.

Refer to product labels for complete application details. Additional technical information is available on our website ([bioworksinc.com](http://bioworksinc.com)) or from your BioWorks technical sales representative. CEASE®, MilStop®, Molt-X®, RootShield® and SuffOil-X® are registered trademarks of BioWorks, Inc. BotaniGard® and Mycotrol® are registered trademarks of LAM International. Always read and follow label directions.