Biological Control of Nursery Pests

Biological treatments for use in commercial nursery applications

Insect or mite	Natural enemy	Species	Useful information
aphid	predatory midge	*Aphidoletes aphidimyza*	Commercially available. Maggot-like larvae are voracious predators of aphids. Adults may go into diapause with low light or short days.
	parasitoid wasps	*Aphidius ervi, A. matricariae, A. colemani, Aphelinus abdominalis, Diaeretiella rapae, Lysiphlebus testaceipes, Trioxys pallidus*	Some species commercially available. Many parasitoids have preferred hosts
	hover flies		Maggot-like larvae are voracious predators of aphids. Pollen and nectar feeding adults are commonly seen around flowers.
	lady beetles ("ladybugs")	Many species including: *Hippodamia convergens, Harmonia axyridis, Coleomegilla maculata, Coccinella septempunctata*	Note: use of non-local, wild-harvested lady-beetles is discouraged due to potential movement of lady beetle pathogens and parasites.
	lacewings	Chrysopa spp., *Chrysoperla carnea, C. rufilabris, C. comanche*	Some species commercially available.
	minute pirate bugs	*Orius* spp.	Some species commercially available. Both adults and larvae are predators of small eggs, insects, and mites.
	soldier beetles	*Podabrus* spp., *Cantharus* spp.	Both adults and larvae are predators. They supplement their diet with nectar and pollen.
	big-eyed bugs	*Geocoris* spp.	Both adults and larvae are predators.
caterpillars	bacterial endotoxins Btk, Bta	*Bacillus thuringiensis kurstaki* (Dipel, various), *Bacillus thuringiensis azawai* (Zentari)	Formulated into commercially available microbial pesticides. Best used on young larval instars.
	viruses	Naturally occurring viruses including granulosis virus and nucleopolyhedrosis virus.	Some strains are commercially available for specific pests such as codling moth.
	parasitoid wasps of eggs	*Trichogramma minutum , T. bactrae, Trichogramma platne, T. brassicae, T. pretiosum, T. platneri*	Some species are commercially available.
	parasitoid wasp of larvae	Many species, particularly in the families: Braconidae, Ichneumonidae	Adult wasps often feed on nectar, insectary plants may enhance activity.
	parasitic flies	Several species in the family Tachinidae	
	ground beetles	Several species in the family Carabidae	
	lacewings	*Chrysopa* spp., *Chrysoperla carnea, C. rufilabris, C. comanche*	Some species are commercially available

Biological treatments for use in commercial nursery applications

Insect or mite	Natural enemy	Species	Useful information
leafminer	parasitic wasps	*Diglyphus* spp.	Commercially available. Used for management of *Liriomyza* spp.
		Dacnusa sibirica	Commercially available. Used for management of *Liriomyza* spp.
	entomopathogenic nematodes	*Steinernema feltiae*	Foliar applications in greenhouses
peach twig borer	braconid wasp	*Macrocentrus ancylivorus*	
	chalcid wasps	*Copidosoma* (=*Paralitomastix*) *varicornis*, *Hyperteles lividus*	
	itch mite	*Pyemotes ventricosus*	
root weevil	pathogenic nematodes	*Heterorhabditis heliothidis, H. medidis, Steinernema carpocapsae, S. feltiae, S. kraussei, S. riobravis*	
	carabid beetles	several species	
spider mite	predatory mites	*Neoseiulus californicus, N. fallacies, Amblyseius hibisci, Phytoseiulus persimilis, P. macrophililis, P. longipes, Galendromus* (*Metaseiulus*) *occidentalis*	
	minute pirate bugs	*Orius* spp.	
	predatory lady beetle	*Stetorus* spp.	
	predatory midge	*Felitiella* spp.	

Note: Adapted from Amy J. Dreves, Leonard Coop, and Mario Ambrosino.

Aphids have many natural enemies including parasites and predators. Some of the natural enemies can be encouraged with conservation, including use of selective pesticides, and habitat modification. Augmentation of natural enemies generally occurs most successfully in protected environments. More information on specific natural enemies can be found in the Aphid Natural Enemy Table. Additionally, aphids may also experience epizootics from both naturally occurring fungi such as *Entomophthora* spp. and application of commercially available microbial pesticides such as *Beauveria bassiana* (Botanigard, Naturalis L) and *Paecilomyces fumosoroseus* (PFR 97)

For more information, see materials listed for aphid in:
Chemical Control of Nursery Pests

Caterpillars—Soft-bodied caterpillars present a vulnerable target for parasitic wasps such as ichneumonids, braconids and chalcid and parasitic flies called tachinids. These wasps and flies use an ovipositor (ovi = egg, positor = placer) to insert their eggs onto or through the soft cuticle of the caterpillars. The eggs hatch to become internal or external parasites.

Root weevils—More information on the use of beneficial entomopathogenic nematodes *see*: PNW Nursery IPM: Entomopathogenic Nematodes: http://oregonstate.edu/dept/nurspest/entomopathogenic_nematodes.htm

Links:

Suppliers of Biological Control Agents:

- Suppliers of Beneficial Organisms in North America—http://www.cdpr.ca.gov/docs/pestmgt/ipminov/bensup.pdf
- Association of Natural Biocontrol Producers—http://www.anbp.org/
- Biocontrol of Root Weevils—http://oregonstate.edu/dept/nurspest/Biocontrol_%20root%20weevils.html
- Biological Control of Twospotted Mite—http://oregonstate.edu/dept/nurspest/two-spottedmite.htm
- Conservation of Biological Control Agents:
- Koppert Biological Systems—http://www.koppert.nl/Side_effects.html
- Biobest Biological Systems—http://www.biobest.ca/