

Round Peg in a Square Hole



Matching the Biological Control to the Customer's situation

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Biological Controls Available in North America

Native Species

- ▶ No or little Regulatory issues provided they are “widespread”
- ▶ Many are capable of “establishment” or “persistence”
- ▶ Most have a Critical Daylength and some combination of temperature threshold
- ▶ Introduced may be superseded by Natural volunteers from outdoors

Exotic (Tropical) Species

- ▶ Strictly controlled by Regulators, now (non-native Generalists will not be considered)
- ▶ The Tropical ones have no light level requirements (overly simplified)
- ▶ Temperature range is often quite low and high, if fitness isn't an issue



Examples of Native and Non-native Biological Controls

Native

- ▶ *Stratiolaelaps scimitus* (used to be *Hypoaspis miles*) BC
- ▶ *Aphidoletes aphidimyza* BC
- ▶ *Neoseiulus fallacis* Ontario
- ▶ *Stethorus punctillum* Ontario
- ▶ *Delphastus catalinae* Florida
- ▶ *Orius* species California
- ▶ *Dicyphus hesperus* California
- ▶ *Dalotia coriaria* (used to be *Atheta coriaria*) Ontario

Exotic

- ▶ *Phytoseiulus persimilis* New Zealand
- ▶ *Neoseiulus cucumeris* (non-diapausing) France?
- ▶ *Amblyseius swerskii* Spain
- ▶ *Amblyseius andersoni* Netherlands
- ▶ *Amblyseius degenerans* Turkey

Grower's Expectations: Food Crops

- Management of pests below the “economic” threshold, allowing normal production levels without cosmetic damage.
- Some damage is OK, but pest pressure should always be on the downturn.
- Predators and/or parasitoids should be easily scouted with known hotspots showing recovery



Grower's Expectations:Ornamentals

True Prevention Required

- No detectable pests or associated damage
- Monitoring by sticky traps and trapping plants only





Ornamental Crops require Prevention and Maximum Efficacy

► Prevention Qualities

- Mites capable of moving from plant to plant over the ground
- Flying insects capable of searching and discrimination
- All Beneficials need to be fit, undamaged by shipping, hungry, and capable of performing in the existing environment.
- Supplemental food (e.g. pollen) may be detrimental

► Customer's Duties

- Maintaining a reasonable environment
- Ensuring fans are off or low during searching activities
- Creating a "Dusk" situation
- Purchasing Beneficials that match the situation and are "fit"
- Reducing plant stress
- Avoiding "banker" systems



Comparison of appropriate BCA's (Biological Control Agents)

Ornamental (prevention)

- ▶ Spider Mite; *fallacis* and *Stethorus*
- ▶ Whitefly; non-refrigerated *Encarsia* and *Delphastus*
- ▶ Aphids; non-refrigerated *Aphidoletes* and non-refrigerated parasite (must be reared on target)
- ▶ Thrips; slow released *cucumeris* and *swerskii*
- ▶ Fungus gnats; *Stratiolaelaps*
- ▶ Root aphids & Weevils; *Stratiolaelaps*

Food (economic management)

- ▶ Spider Mite; *persimilis*
- ▶ Whitefly; *Encarsia*, *Eretmocerus*, and *Delphastus*
- ▶ Aphids; *Aphidoletes*, *Aphidius* species, and Lacewings (and Ladybugs)
- ▶ Thrips; *cucumeris*, *swerskii*, and *Orius*
- ▶ Fungus gnats; *Stratiolaelaps* and nematodes
- ▶ Root aphids and Weevils; *Stratiolaelaps* and nematodes