



from commercial suppliers/distributors in containers, sachets, or holding packets that are directly attached to plants or containers, which may be useful for hanging baskets.

### Conclusions

There is more interest in using beneficial insects and mites because of concerns affiliated with insect and mite pest populations that have developed resistance to commonly used insecticides and miticides, and the issues associated

with neonicotinoid systemic insecticides and supposed impacts on pollinators. However, the use of beneficial insects and mites requires a different mindset compared to using pesticides. Therefore, greenhouse producers should consult with state or university-based extension personnel (horticulture or entomology) on how to develop a successful biological control program. GM

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Containers of biological control agents

# A SUCCESSFUL *start*

Ensure maximum efficiency of your biocontrol program by performing proper quality checks on products upon arrival.

*Excerpted with permission from "Grower Guide: Quality Assurance of Biocontrol Products," compiled by Rose Buitenhuis, PhD, Research Scientist, Biological Control, Vineland Research and Innovation Centre, 2014*

**S**uccessful biocontrol programs are dependent on a number of factors, but good quality natural enemies are fundamental. However, as living organisms, biocontrol products are subject to variability caused by various factors, starting at the insectary where they are reared through to the crop where they are released. Production of biocontrol agents is a self-regulated industry and quality assessments by the end-users are important to provide producers with feedback and to maintain high quality products.

Biocontrol suppliers are facing the challenge of producing a constant and reliable supply of high quality natural enemies. Therefore, quality control (QC) checks are done at the supplier level to make sure the products meet certain standards before they are shipped to the customer. However, it often takes several days before the products arrive at the grower and are released into the greenhouse. During this time, uncon-

trolled packaging, transport and storage conditions may affect the quality of the product and therefore the performance in pest control.

Shipping is probably the most critical period. Temperature extremes, condensation from ice packs, restricted oxygen supply, unnatural high population densities and long shipping and storage times are some of the factors that can adversely affect quality. Therefore, growers should open packages upon arrival to provide a better environment for the biocontrol agents and to detect any potential problems related to shipping conditions (too warm, too cold, wet, bad smell).

In an ideal situation, growers would perform quality checks on every biocontrol product they receive as quality will directly impact efficacy; a shipment of poor-quality can result in failure to control the target pest. If a quality issue is detected the grower can react proactively, adjusting release rates accordingly.

One of the set-ups used to effectively count biocontrol products.



*Amblyseius swirskii* mite eating a thrips larva.

## GENERAL GUIDELINES AT RECEIPT OF A PACKAGE

- 1** Open package [and] look for condensation or fermenting smell, temperature of contents.
- 2** Individual products: look for movement [and] when applicable, flying.
- 3** If shipped as pupae or mummies, record the number of emerging adults.
- 4** Based on quality control tests at the producer, more product might be present in the container than stated on the label to compensate for low emergence or high mortality.
- 5** If both adult females and males are present, sex ratio should be at least 40 to 45 percent females [to 55 to 60 percent males].
- 6** Keep good records. Take notes of species name, packaging type/size, date received, company batch number, date tested, method used, number of samples, number of biocontrol agents counted and any other observations on the appearance and performance of the product.
- 7** If a potential problem is detected, communicate with the supplier. Note that the small number of samples recommended in this guide tends to underestimate the total number of biological control agents in the package. If the tests indicate that the package contains less than 70 percent of the biological control agents, a problem should be suspected.
- 8** After completing this general check, you can proceed to the quality checks pertaining to the specific biocontrol agent you have received.

You can view more information on materials needed to carry out quality checks and protocols to follow based on species by consulting “Grower Guide: Quality Assurance of Biocontrol Products” in its entirety at [bit.ly/1NnmWu](http://bit.ly/1NnmWu). If you would like to learn more about biologically based Integrated PM in greenhouses, check out the new website [www.greenhouseIPM.org](http://www.greenhouseIPM.org). GM