

How to Check the Quality of Biological Control Agents

Tools:

- 10-15 X magnifying hand lens or headband magnifier or dissecting microscope
- Small, clear plastic containers with tight lids, plastic bags, vials or petri dishes
- Fine paint brush
- Record book

Reputable suppliers of biological controls usually include 10-25% more insects or mites than the number stated on the container. This is to allow for deaths during shipping and handling. As there are always some dead animals in a container, what is important is the number of live, healthy animals actually received. This sheet describes how to take samples and check the counts of biological control products you receive.

Sampling studies have shown that packages from any supplier may have an occasional high or low count. Because there is always a chance that a sample will contain an unusually high or low number, the more samples you take from a particular shipment, the more accurate your estimate will be of the real number shipped. In practice, growers do not have much time to spend checking samples, therefore, if you only take one sample from a shipment you should sample several shipments in a row to get a fair idea of the consistency of the counts.

It is essential to keep good written records, including the date the shipment was received, as well as any dates or lot numbers that appear on packages. The supplier needs this information to trace which production series packages came from.

What to do if you don't like the results:

- If you receive a shipment of biological control agents and they are all dead, it is likely that something disastrous occurred during shipping. *Call the supplier immediately to file a claim.*
- If there are live ones, but the counts are low, let the supplier know before you discard the samples. A local representative may want to examine the containers to find out what went wrong and how to remedy the problem. *Complain about consistently low counts.*
- If there is a serious problem or you are having difficulty doing the counts, try to find an extension agent or pest manager to help you.

'Encarsia' (*Encarsia formosa*)

Most producers now ship these parasitic wasps as loose pupae or as pupae glued onto cards. The only number that matters is how many *Encarsia* emerge from the card after it is received—not how many black scales (pupae) are glued to the card. This is because only about 65-80% of pupae will actually emerge after the trauma of handling and shipping. Counting the number of black scales with emergence holes in the back is difficult and not a good indicator of product quality because some may have emerged before the package was received.

The most reliable method is counting the emerged adults. The total number emerged should equal, or exceed, the number specified to emerge from a sample or card.

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- Take at least one sample card from the order or a fixed volume of loose pupae (such as 1/10th or other known proportion of the total quantity). Place in a small, tightly closed plastic petri dish or clean pill vial. If you do not intend to use the emerged adults, placing a small piece of yellow sticky card in the container will make counting easier as the Encarsia stick to the trap.
- Hold the sample in a warm place (22-25°C/73-80°F), but not in sunlight, until the wasps emerge. Warmer temperatures will speed emergence and give faster results.
- To count them you can either:
 - a) wait until all Encarsia have emerged (about 7-14 days) and count the total number of dead wasps in the vial under 10X magnification; or
 - b) count the live Encarsia each day as they emerge, then release them into the greenhouse and replace the lid. In addition to giving a total count, this method preserves the wasps and shows you the pattern of emergence.

Note: White, unparasitized scales or chaff found on the cards is not usually a problem. This is because any whitefly that might have been alive when the Encarsia were harvested are killed in the process of removing the pupae from leaves.

'Persimilis' (*Phytoseiulus persimilis*)

In granular carriers (e.g., vermiculite).

If the container is transparent, you should be able to see the tiny, orange mites running on the sides of the container before you open it. If a food source is included in the package, most mites will remain in the carrier and will not be visible.

- Let the container come up to room temperature while lying on its side. Then, following instructions on the container, gently mix the mites into the carrier.
- Shake about 3 ml (1/2 teaspoon) of carrier into a small, white dish or piece of paper.
- Using the eraser end of a pencil, sort through the vermiculite, counting and squashing active predators as they run away; alternatively, predators may be saved alive by using a fine, wet brush to transfer them to mite-infested leaves.

On bean leaves.

- Visually inspect several leaves from different parts of a container, checking that the leaves have not become moldy and that active predators and their eggs are present.
- Under 10-15X magnification, scan both surfaces of a leaf, counting the mobile stages of the Persimilis.

'Aphidoletes' (*Aphidoletes aphidimyza*)

Aphid midges are usually shipped as pupae in vermiculite.

To check emergence:

- Place one container with the lid open, in a 2L (2quart), clear plastic bag. Get as much air into the bag as possible by opening it wide, then pinching the top of the bag shut and twist-tying it far enough down the bag to force the trapped air to inflate the lower 2/3 of the bag (don't use your breath to blow it up). This makes a self-supporting transparent "cage" in which it is easy to see and count the midges as they emerge.
- Hold this cage for 10-14 days at room temperature. Do not leave it in the sun.
- To count emerged adults, either:
 - a) let all of the adults collect in the bag, then count the total number of dead midges, or,

b) once the midges start emerging, count the number of adults each day, then let them out in the greenhouse and re-close the bag.

'Cucumeris' (*Amblyseius cucumeris*)

The predator mites are shipped in bran, which is their culture medium. They are very hard to see, and making accurate counts requires a 10-15X microscope.

- You can determine whether a shipment is healthy by checking for predators inside the lid of the container or in the bran carrier under 10-15 X magnification. Healthy predators are light tan and move more quickly than the food source mites, which are hairy, smaller, slow moving and white or translucent.

If you open a container and it smells strongly of ammonia, the mites are probably not in good condition.

Check the carrier in the slow release bags by the same methods. Individual bags should be filled with a loose (not clumped) culture mixture. It should not smell of ammonia or yeast and bags should be dry.

'Hypoaspis' [*Stratiolaelaps (=Hypoaspis) miles*]

These predator mites are usually shipped in a vermiculite-peat carrier. Check the carrier under 10-15X magnification for active mites. The predators are tan and move very quickly, compared to their food source mites, which are smaller, slow moving and white or translucent.

Quick check method:

- Let the container warm up to room temperature (21-25°C/70-77°F) for at least 1 hour,
- Sprinkle some of the carrier into the palm of your hand or on a white piece of paper, wait 20 seconds, then pour it back into the container.
- The predator mites remain and are easy to see running over the paper or your hand.

To estimate the total number of predators in a container:

- Pour the container into a larger pail and mix thoroughly
- Take at least five 20-ml samples as for the quick check method, above, counting the mites running over the paper.
- Multiply this total by 50 to determine the number of predators in 1 litre (=1000 ml).

'Aphidius' (*Aphidius matricariae* and other species)

Aphidius are shipped either as adults in vials with a food source, or as pupae (aphid 'mummies').

Shipped as adults

You should be able to see the adults flying free in the container, with very few caught in condensation on the sides. They must be released as soon as possible as there is limited food for them in the container.

- To count emerged adults, either: a) release adults in small groups into a plastic bag to make them easier to count, then release in the greenhouse, or, b) hold one sample until the wasps have died, then count the total number.

Shipped as pupae ("mummies")

There should be very few adults flying in the container when you receive it.

- Release the adults according to the label instructions, and hold the mummies for 10-14 days, until they should all have emerged. Count the number of aphid mummies with smooth, round exit holes in the back, which show adults have emerged successfully.

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Note: Smaller irregular exit holes in mummies, and the presence of smaller adult parasites may indicate hyperparasites are present; these are harmful and can impair biocontrol programs.

'Orius', 'Delphastus', 'Harmonia', 'Stethorus' and other large insects:

It is easy to see whether or not these insects are alive. They will not be active if they are cold, so bring containers to room temperature first.

- A fairly accurate count can be made by removing the insects one by one from the container, using a fine dry paint brush. Watch for escapees and count them. It is normal to find a few dead insects in the container, but you should still receive the live number stated on the container.

Other Biological Controls

For quality control checks of other predatory mites, follow the procedures given above for *Persimilis*.

To check biological control agents not listed above, please contact your distributor for instructions.