Aphidius
Aphid parasite

Biocontrol organism

Aphidius colemani

Aphidius wasps are about 3 mm long. The adult female wasp lays its eggs into aphids, and when the wasp eggs hatch the larvae begin to devour the aphid from the inside.

Aphidius larvae pupate and develop into fully formed wasps inside the aphid, killing it in the process. The aphid swells and develops a crusty shell, and may develop a golden or silvery appearance. This is then called an 'aphid mummy'.

When fully mature the emerging wasp chews a neat circular hole in the back of the aphid shell and emerges to find food and to mate. Adult wasps feed on nectar and honeydew from the aphids. Development from egg to adult aphidius takes 10 days at 25°C and 14 days at 21°C.

After mating, the female goes in search of an aphid in which to lay her eggs. A female wasp can parasitise over 100 aphids during her life of 5–14 days. Fertilised eggs develop into females and non-fertilised eggs into males. There are typically two females to every male.

Aphidius colemani is native to North America but has now spread throughout the world. They are mass-reared in New Zealand but not, at present, in Australia. However, this and related species are very important naturalised enemies of aphids in most districts in Australia.

Plate 41: Aphidius inspecting aphids

Target pests

- Green peach aphid *Myzus persicae*
- Melon or cotton aphid *Aphis gossypii*
- Cow pea aphid *Aphis craccivora*

Aphidius colemani has a relatively wide host range and is commercially reared in many countries to target a range of aphid pests.

Suitable crops/environments

Aphidius commonly occurs in unsprayed or minimally sprayed crops, and often reduces aphid numbers to very low levels. However, its natural increase may be slower than desirable for the grower and some damage may occur in the interim. Releases of mass-reared aphidius at the first sign of aphids, or in anticipation of aphids, can prevent pest numbers increasing to a level that warrants applying chemical insecticides.

In New Zealand, *Aphidius colemani* has so far been mainly used in protected crops such as capsicum, tomatoes, cucumber and some chrysanthemums; but it can also be used in minimum-chemical field crops and orchards.

Before release

Aphids breed very quickly, so it is important to be ready to release the parasite at the first sign of aphids on plants or sticky traps. In protected crops susceptible to aphids, such as capsicum, start releasing parasites when the plants are very small. Make sure there are no harmful chemical residues in the crop; some chemicals may be toxic several weeks after they are applied. Applying pesticides can also cause a dramatic increase in aphid populations by destroying their natural enemies.

If aphids have already increased, apply an aphicide with a short residual period. Spot spraying may be appropriate if aphids are localised. (See the chemical toxicity table for more information.)

In some districts viruses transmitted by aphids are the issue, rather than the damage caused directly by the aphids. Even a very small number of aphids can infect the crop with viruses. In such cases, aphidius may not be a suitable control agent, unless regular releases are made as a preventive measure.

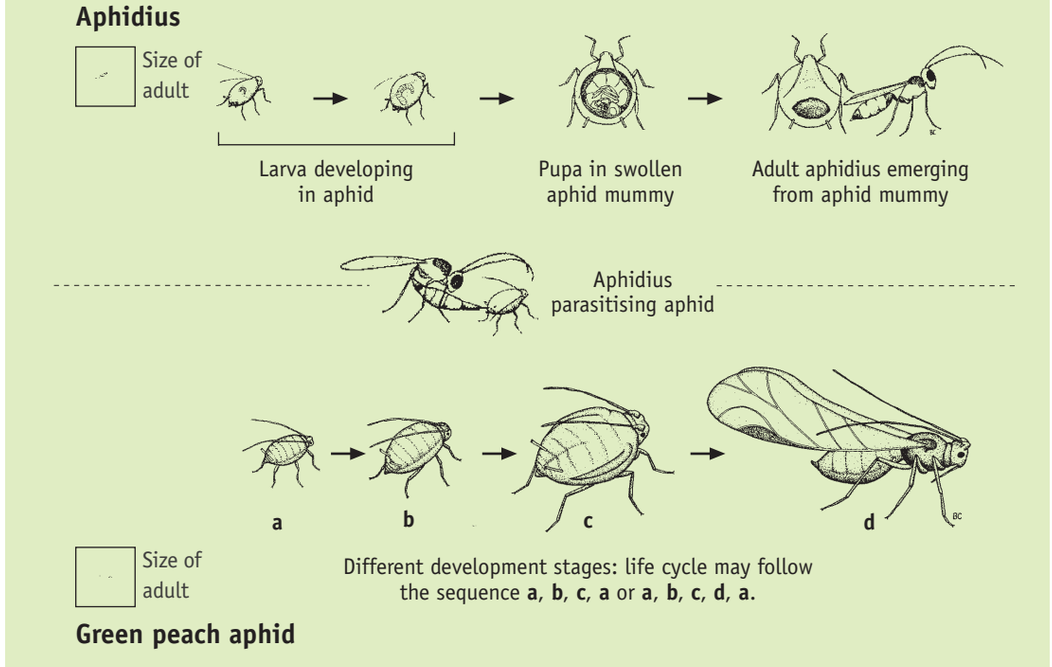

Figure 10: Life cycles of aphidius and green peach aphid

Plate 42: Aphidius parasitising an aphid

At release

Aphidius is dispatched in the form of aphid mummies or as adults. When the mummies are supplied on cards, these can be clipped onto support wires or branches in a grid fashion through the crop. If there are particular problem areas, more parasites should be placed in those areas. Wasps will emerge from the mummies 1–2 days after arrival. The wasps are very mobile and will disperse to search for aphid colonies.

Regular releases are recommended for indoor crops, and for crops that do not harbour the large numbers of aphids necessary to maintain a useful population of aphidius.

If weather conditions are unfavourable for release, the aphid mummies can be stored at 10°C for up to a week, depending on previous storage and how close they are to emergence.

Recommended release rates

Details about the best timing, release rates and frequency of release for various crops are best discussed with suppliers to suit specific situations. However, some general guidelines are provided here.

Release rates will range from 1000 mummies per hectare for low pest levels and inoculative releases, to 5000 per hectare for high pest levels and quick knock-down. Two or three releases, a week apart, are recommended in most situations. For preventive treatment, weekly introductions at low rates are recommended.

After release

The hatched female wasps will seek out suitable host aphids in which to lay their eggs. All instars can be parasitised. Early-instar aphids cease to feed about 24 hours after parasitisation, whereas late-instar aphids may continue to feed for about 3 days. Adult aphids live for about a week, and it takes about 10–14 days before adult wasps will emerge from parasitised aphids. A second release, a week after the first, is therefore recommended to provide a steady presence of wasps in the 2 weeks after initial release.

When wasps find a colony of aphids they tend to parasitise as many as possible. Typically, when one or two mummies are observed in a colony of 20 aphids it is likely that most are parasitised but are yet to develop the mummy appearance. Expect the first mummies to appear in the crop about 10 days after release.

How much the aphid population can increase without causing economic damage will vary from crop to crop, and with plant stage. If a crop can tolerate reasonable numbers of aphids, the subsequent number of wasps emerging from parasitised aphids can be very high, and aphid numbers will crash soon after.

In crops that cannot tolerate aphids, regular releases of aphidius are desirable. The aphid population will not be sufficient to support the necessary population of wasps to maintain good control when an outbreak occurs.

If aphids are deemed to be causing damage or producing excessive honeydew, various 'soft' options are available to knock down the numbers and allow the wasps to catch up. See 'Chemical use' below and the chemical toxicity table.

Plate 43: Aphid mummies showing the wasp escape hole

Plate 44: *Aphis gossypii* on greenhouse cucumber

Cultural practices to aid aphidius establishment

Aphidius adults feed on nectar and honeydew. The persistence of aphidius from one season to the next will be influenced by the presence of other plants in the area that can host suitable aphid pests. Various winter crops — for example lucerne, grain crops and some weeds such as milk thistle — provide hosts for aphids and so for aphidius as well.

In protected cropping, 'banker' plants of grain with cereal aphids and aphidius can be used to maintain the population of the wasps.

Chemical use

Aphidius adults are susceptible to many chemical insecticides and their residues. Aphidius larvae developing inside the aphids are to some extent protected from sprays, and adults may emerge unscathed several days after a chemical insecticide spray. Fungicides are generally safe to use with aphidius, but there are some exceptions. See the chemical toxicity table for further information.

Additional information

Other mass-reared beneficials are often used in conjunction with aphidius in protected crops to target a complex of pests. These include persimilis (*Phytoseiulus persimilis*), cucumeris (*Neoseiulus cucumeris*) and encarsia (*Encarsia formosa*).

In some districts hyperparasitoids are present and reduce the numbers of aphidius progeny that would otherwise be generated. These wasps lay their eggs into aphids that have already been parasitised by aphidius. The aphid still dies, but the developing aphidius is also consumed by the hyperparasitoid. The presence of hyperparasitoids is indicated by a jagged escape hole rather than the neat circular hole made by an emerging aphidius.

Other natural enemies of aphids

Green lacewings and brown lacewings
Predatory beetles, e.g. common spotted ladybird *Harmonia conformis*
Predatory bugs, e.g. pirate bugs *Orius* spp.
Common hoverfly *Simosyrphus grandicornis*
Predatory gall midge *Aphidoletes aphidimyza*