

# Enforce™ for Greenhouse Whitefly Control

*Encarsia formosa* - Parasitic wasp

**Enforce™** is a tiny parasitic wasp that specializes in parasitizing whitefly, specifically greenhouse whitefly (*Trialeurodes vaporariorum*), although it will attack other whitefly species.

It is very useful in greenhouse crops as part of an Integrated Pest Management programme, and has been used successfully in crops such as tomato, cucumber, eggplant and ornamental plants.

## The Pest: Greenhouse Whitefly

Greenhouse whitefly adults are small, white, fly-like insects that are generally found in the head of plants and the undersides of the leaves, and cause damage by sucking sap from the plant.

Greenhouse whitefly lay their eggs on the underside of leaves, where they mature through four nymph or 'scale' stages before emerging as adults. All nymph and adult stages cause damage to the plants, and in severe infestations they may kill plants.

Signs and symptoms of a greenhouse whitefly infestation may include:

- Adult greenhouse whitefly present on the plant, generally near the top on new growth
- Greenhouse whitefly eggs and pupae may be present on the plant (a hand lens may be required to see some nymph stages)
- Plants may appear weak, and growing poorly
- Honeydew and black sooty mould may be visible on stems and leaves

## The Solution – Enforce™

The **Enforce™** wasp is 0.6 mm long and is recognizable by its black head

and thorax and a yellow abdomen.

A female wasp inserts her eggs into 3rd and 4th instar nymphs of greenhouse whitefly.

The egg hatches and the wasp's larva develop inside greenhouse whitefly nymph eventually killing it.

After about 10 days, the greenhouse whitefly nymph will begin to turn black, and about 10 days later an adult wasp will emerge.

Once the **Enforce™** wasp has hatched, it will seek out more whitefly nymphs to parasitize, leaving the black case behind.

**Enforce™** is not considered harmful to humans and animals, and no environmental impacts are expected.

## Environmental Conditions Required

**Enforce™** works best at temperatures of 20-28 °C, below 18 °C the wasp's activity decreases, and temperatures above 38 °C are lethal. A wasp life cycle will take between 10 and 30 days, depending on temperature.

### Wasps per metre squared:

Infestation	Cucumbers	Ornamentals	Tomatoes	Vegetables
Preventative	2-6	1-3	1-3	1-3
Light	6-12	3-6	3-6	3-6
Heavy	12+	9+	9+	9+

**Enforce™** should ideally be introduced to the crop when greenhouse whitefly populations are low as a preventative.

It is recommended that **Enforce™** is introduced regularly when whiteflies are present, initially at a minimum of every 2 weeks over at least an 8 week period.



The pest: whitefly (left) & the solution: Encarsia (right)



Normal whitefly pupa (white) and parasitized pupa (black). An adult Encarsia will emerge from the black scale.



Enforce Tag

Monitor your plants once a week, and after four weeks black 'scale' should be present. When 80% of the 'scale' is black, the release rate can be re-evaluated.

Tags can be concentrated in greenhouse whitefly 'hotspots' within your crop. **Enforce™** adults are able to fly about 20 metres and disperse readily.

Higher release rates may be required during the winter when temperatures are lower and control is more difficult.

## Packaging

**Enforce™** is supplied as black parasitized greenhouse whitefly nymphs or black 'scale' on cardboard tags, and the adult wasp emerges from this 'scale'.

**Enforce™** tags are sent via fast-post or courier (at the customer's request).

Two tag sizes are available:

Mini Tags 100 viable Enforce wasps will emerge

Maxi Tags 250 viable Enforce wasps will emerge

## Release and Storage Instructions

**Enforce™** tags need the following handling and treatment:

- Do not touch the black 'scale' on the tags
- Do not expose the tags to direct sunlight
- Hang the tags immediately within the crop,
- If the tags must be stored, store them in darkness at 10-15 °C.
- DO NOT REFRIGERATE
- Do not store the tags for more than 2 days
- Tags come in strips of up to 10; tags should be separated and hung individually
- Hang tags one metre below heads of crop, so the wasps work upwards
- Hang tags in shade
- Ensure tags are hung in different places each week
- Tags should be distributed evenly through the crop
- Leave tags in crop for at least 14 days

## Post Release

**Enforce™** adults will begin to emerge from the black 'scale' on the tags within 2-6 days at 20 °C. The black case will stay attached to the tags. A small hole should be visible with a hand lens once the adult has emerged.

After three weeks it is safe to assume all Enforce wasps have hatched, so the tags may be removed if desired.

Within four weeks of release, black 'scale' should be present within your crop, on the lower leaves of your plants. Adult wasps should emerge within 2-3 weeks.

Before introducing Enforce into your crop, please check residual chemical effects and ensure you know chemical compatibilities and products that may be applied.

Before introducing Enforce™ into your crop, please check residual chemical effects and ensure you know chemical compatibilities and products that may be applied.

Lists of compatible pesticides and persistence periods can be found in the publication "The Good Bug Book", Second edition (2002), editor Richard Llewellyn. Excerpts of the book can be obtained from the Encarsia page of the Australasian Biological Control Association website.

## Price

**PRICE: \$10.00 per 1000 wasps (minimum order) plus GST and Freight**