



Encarsia formosa

Whitefly parasite

by Applied Bio-Nomics

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- **Target pests:** the greenhouse whitefly (*Trialeurodes vaporariorum*), and to a limited extent, the sweet potato whitefly *Bemisia tabaci*, but not the ash whitefly.
- **Optimal conditions:** temperatures greater than 18°C (64°F) and bright light. Relative humidity should exceed 60%, and whitefly populations will hinder movement of the parasite.
- **General introduction rates:** Use 1-5 Encarsia/m² (1-5 Encarsia/10 ft²) or 1-5 parasites/infested plant weekly or until control is achieved. Higher rates are necessary for the sweet potato whitefly. For greenhouse tomatoes or sweet peppers, 1 Encarsia/4 plants weekly; and for greenhouse cucumbers use 1 Encarsia/2 plants weekly.

Encarsia was one of the first biological control agents developed. This minute (<1 mm, 1/25 inch long) parasitic wasp (insect order *Hymenoptera*) is probably tropical in origin. It does not sting humans.

Target pests of this parasite are greenhouse whitefly and sweet potato whitefly. Growers should monitor for these pests weekly by using yellow (not blue) sticky strips or cards, at a rate of 1 trap/50-100m² (1 trap/500-1,000 ft²). Traps should be placed just above the plant canopy. Yellow sticky tapes can also be used to trap adult whitefly. Use up to one tape per plant, and hang tapes at the same height as monitoring cards. The sweet potato whitefly may be more effectively trapped by lowering the tapes within the canopy. Sticky traps and tapes should be replaced every 3 weeks. It is imperative to identify the whitefly species present in a crop in order to choose the most appropriate release rate.

Life cycle

With the exception of the adult, all stages of Encarsia occur within the whitefly host. Adults are tiny wasps that lay eggs inside 2 week-old whitefly scales (second and third whitefly larval stages). Each egg will kill one whitefly scale. Adults lay up to 200 eggs. The parasite then develops inside of the whitefly scale, and midway through the development of the Encarsia within the whitefly, the scale turns dark. It becomes black for greenhouse whitefly, and transparent brown for sweet potato whitefly. This occurs after 10 days at normal at normal greenhouse temperatures. Another 10 days are required before adults emerge. Adult Encarsia emerge from the parasitized scale by chewing a hole in the top of the scale. Adults can live for 30 days but normally are active for about 10 days. The complete life cycle requires nearly 28 days in commercial greenhouses.

Adults also kill whitefly scales by direct feeding. Otherwise, they feed on honeydew secreted by the whiteflies. Excessive amounts of honeydew hamper activity of the parasite. Although they are good flyers and will seek prey if necessary, the Encarsia tend to remain in regions where the

whitefly are concentrated. It is important to distribute the Encarsia well throughout the greenhouse.

Temperature has a significant effect on Encarsia development. At 25 C (77 F) larval development requires 15 days, while at 15 C (59 F) 45 days may be required. At daytime temperatures less than 18 C (64 F), adult activity is sharply reduced, and Encarsia will be less effective. Temperatures between 20-25 C (68-77 F) are optimal.

Formulations

Encarsia are sold as black parasitized scales that have been fixed to cards. Each card contains 150 developing parasites. A strip of 10 cards contains 1,500 Encarsia whitefly parasites. No adults will be visible on the cards.

Introduction

It is important to hang the cards from lower leaves in the shade, and avoid wetting them while watering. If hanging baskets are in green houses, some cards must be placed on the baskets, as well as with plants on benches. Do not attempt to use this parasite if high whitefly populations are present with excessive honeydew. Rates must be at least double for control of sweet potato whitefly.

Compatible Pesticides

Encarsia is extremely sensitive to insecticide residues. In greenhouses with plastic materials (i.e. covering or flooring), plastics may harbor residues at levels toxic to this parasite. Many fungicides are safe with spreader stickers are harmful.

Compatible Pesticides

Insecticides

- Dipel (Bacillus thuringiensis)
- Enstar (Kinoprene)
- Vendex (fenbutation oxide)

Fungicides

- Benlate (benomyl)
- Botran (dicloran)
- Daconil2787 (chlorothalonil)
- Exothern termil (chlorothalonil)
- Karathane (dinocap)
- Kumulus, Microniasul (sulfur)
- Rovral (iprodione)

Growth Regulators

- B-Nine (daminozide)
- Cycocel (chlormequat chloride)