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Standard Specification for *Encarsia formosa* Gahan (*Hymenoptera:Aphelinidae*)[1]

This standard is issued under the fixed designation E 2199; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

~~1.1This specification covers information on and the test method for determining the purity and number of adults released in shipments of *Encarsia formosa*, parasite of the greenhouse whitefly, *Trialeurodes vaporariorum* Westwood.~~

1.1 This specification describes a method for determining whether the quantity of quality of adult *Encarsia formosa* in a shipment adhere to quantity and quality specifications. The test also allows the purity of shipments to be determined. Included are referenced documents, a description of standard terminology, specifications, and the test method.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

E 2200 Specification for Information Included ~~With~~with Packaging of Multi-eCellular Biological Control Organisms

3. Terminology

~~3.1*Definitions of Terms Specific to This Standard:*~~

3.1 *Definitions:*

3.1.1 ~~*life stage when shipped*—immature.~~ critical value—a number that the test statistic is compared to in order to determine whether the quantity and quality requirement has been met. Critical values depend on the probability of error that can be tolerated and on the number of samples used in the test.

3.1.2 *card*—a sample unit; pupae of *E. formosa* are mounted on cardstock strips that are subdivided into cards.

3.1.3 *package claim*—the number of adults expected to emerge from and leave each card.

3.1.4 *test statistic*—the average number of wasps caught during the flight test expressed as a percentage of the package claim.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *name of product—Encarsia formosa* ~~Gahan~~

~~3.1.3*preferred host prey*—greenhouse whitefly, *Gahan.*~~

3.2.2 *preferred host and prey*—Greenhouse Whitefly, *Trialeurodes vaporariorum* ~~(Westwood)~~ (Westwood).

3.2.3 *life stage when shipped*—pupa within the host insect, *T. vaporariorum*.

4. Classification

4.1 *Phylum*—Arthropoda.

4.2 *Class*—Insecta.

4.3 *Order*—Hymenoptera.

4.4 *Family*—Aphelinidae.

4.5 *Genus*~~—Encarsia.~~ —*Encarsia*.

4.6 *Species*~~—formosa.~~

~~**TEST METHOD—Determining the Purity and Number of Adults Released in Shipments of *E. formosa* on Cards**~~

—*formosa*.

5. ~~Summary of Test Method~~

~~5.1This test method describes a method of counting the number of *E. formosa* released from cards.~~

[1] This specification is under the jurisdiction of ASTM Committee E35 on Pesticides and Alternative Control Agents and are the direct responsibility of Subcommittee E35.30 on Natural Multi-Cellular (Metazoan) Biological Control Organisms.

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~~[2] Steinberg, S., and Dale, J., "Designing and Implementing Quality Control of Beneficials Insects: Towards More Reliable Biological Pest Control," Sting, Newsletter on Biological Control in Greenhouses, No. 18, July 1998, pp. 18-19.~~

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

5.2The number of *E. formosa* adults released from parasitized whitefly scales attached to cards will be determined by examining a minimum of 1000 parasitized scales and estimating total number of live *E. formosa* and 95% Confidence Limits (C.L.) per shipment. In each container, live contaminants will be identified and recorded. Quantity and Quality Specification

5.1 The test described in this specification is used for both the quantity and quality assessment. To meet the quantity and quality specification defined by the "package claim," 100 % of the number of adults should be capable of flight as measured by the flight test described herein.

6. Significance and Use

6.1The biological control of greenhouse whitefly by *Purity*

6.1 The purity specification is that shipments, and hence samples, do not contain species other than *E. formosa*.

TEST METHOD—Determining the Number and Flight Capability of *E. formosa* depends on accurate release numbers of adult parasites. Accurate packaging and maintenance of purity and viability of *E. formosa* shipments is, therefore, essential for the effective management of this pest. This test method may be performed by the producers and end-users.

Adults in a Shipment, and Assessment of Shipment Purity

7. Materials

7.1Dissecting microscope or headband magnifier (7 to 10×).

7.245 mm diameter by 90 mm deep, clear plastic vial with snap top.

7.3Fine pointed No. 5/0 paint brush. Scope

7.1 The test describes methods for determining whether the number of adult *E. formosa* that are capable of flight meets or exceeds the package claim. A method of assessing the purity of a shipment is included.

8. Test Unit

8.1A single shipment of *E. formosa* is considered a test unit. Summary of Test Method

8.1 The quantity of *E. formosa* per card and their flight ability is determined by counting the number of wasps caught on a sticky trap suspended in a test chamber. Three or more test chambers are used per shipment, each chamber contains one randomly chosen card with *E. formosa* pupae. The numbers of wasps caught on each sticky card are counted and results are used to calculate the average number of wasps per card. This average is used in combination with the known sampling distribution and variation in counts to judge whether specifications are met. Live contaminants are identified and recorded.

9. Pre-Test Conditions

9.1If samples must be held before testing, hold them between 10 and 15°C, RH 60 to 90%, for a maximum of 24 h. Significance and Use

9.1 This method was developed to determine that the numbers of *E. formosa* supplied in a shipment meet the package claim and that wasps at receipt have good flight capability. The application of this method will ensure a standardized evaluation of the product and judicious decisions about product compliance to the package claim.

10. Sampling

10.1Specify the number of adults that should emerge from individual cards as indicated on the package before conducting the test. Randomly select enough cards per shipment to make up a minimum of 1000 parasites per test unit. Materials

10.1 *Test chamber*, 6.5 by 8 cm acrylic tube.

10.2 *Support wire*.

10.3 *Double-sided dry-stick yellow sticky trap*, 2.5 by 4.0 cm.

10.4 *Nylon screen*, 100-µ mesh.

10.5 *Clear plastic cling film*, see Fig. 1.

10.6 *Headband magnifier*, (7 to 10×) is optional.

11. Sample Preparation and Treatment

11.1Close each individual *Test Unit*

11.1 A single shipment of *E. formosa* card in a 45 mm diameter by 90 mm deep, clear plastic vial. Cut a circle of yellow double-sided sticky trap card the same size as the inside diameter of the lid and attach it to the underside of the lid before closing the vial. During the test, hold the samples upright in a brightly lit area, such as a greenhouse, but out of direct sunlight, at between 20 and 25°C and RH 60 to 90% with a light regime of 16L:8D for at least 14 days or until all adults have emerged. Within this temperature range (20 to 25°C), emergence increases in proportion to the temperature. is considered a test unit.

12. Counting Procedure

12.1Count adult parasites attached to the sticky trap and found at the vial bottom using a dissecting microscope or magnifier (7 to 10×). Identify and record the number of whitefly or other live insects or mites appearing along with the parasites. Pre-Test Conditions