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Standard Specification for *Feltiella acarisuga* (Vallot) (Diptera: Cecidomyiidae)[1]

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1. Scope

1.1 This specification covers information on and the test method for determining purity, sex ratio and number of adults released from commercial containers of the predatory midge *Feltiella acarisuga* (Vallot) (Diptera: Cecidomyidae).

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E2200 Specification for Information Included with Packaging of Multi-Cellular Biological Control Organisms (Withdrawn 2010)[3]

3. Terminology

3.1 *life stage when shipped*—pupae in cocoons.

3.2 *name of product—Feltiella acarisuga* (Vallot)

3.3 *carrier*—folded paper or bean leaves

3.4 *preferred host prey*—spidermites

4. Classification

4.1 *Phylum*—Arthropoda.

4.2 *Class*—Insecta.

4.3 *Order*—Diptera.

4.4 *Family*—Cecidomyiidae.

4.5 *Genus*—Feltiella.

4.6 *Species*—acarisuga.

5. Summary of Test Method (Determining the Purity, Sex Ratio, and Number of Adults Released from Containers of *F. acarisuga*)

5.1 This test method describes a method of counting the number of *F. acarisuga* adult midges released from pupae in cocoons packaged on paper or leaf, determining purity and sex ratio of adults. This test method is used to test a standard commercial package of 250 midges sold as pupae in cocoons on folded paper or bean leaves. Adult midges are allowed to emerge over a ten day period, are counted and sex ratio determined.

5.2 The number of *F. acarisuga* midges released from pupae in cocoons will be determined by examining a minimum of three containers and determining the mean value. Any live parasitoid or arthropod product contaminants will be recorded.

6. Significance and Use

6.1 The efficacy of spidermite control by *F. acarisuga* depends on accurate release numbers of midges, presence of male and female adults, and absence of live product contaminants, especially parasitoids of *F. acarisuga*. (Accurate packaging and maintenance of purity and viability of *F. acarisuga* shipments is, therefore, essential for the effective management of the target pest.) This test method is intended for use by producers and users of the specified biological control agent. It is complementary to the quality guidelines for *Feltiella acarisuga* that were developed by the International Organization of Biological Control and published in Lenteren, J.C. van (ed.), 2003.[4]

7. Materials

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

7.2 Clear polyethylene storage bag, 2 L volume.

7.3 Yellow sticky cards, 50 cm^2.

7.4 Twist-ties.

7.5 Fine pointed paint brush.

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

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[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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] van Lenteren, et al., "Guidelines for Quality Control of Commercially Produced Natural Enemies," *Quality Control and Production for Biological Control Agents—Theory and Testing Procedures*, J.C. van Lenteren, Ed., CABI Publishing, 2003, pp. 278–279.

8. Test Unit

8.1 A single container with *F. acarisuga* is considered a test unit. This test is designed for standard shipments of 250 midges. In large shipments, a minimum of three containers should be chosen at random for testing.

9. Pre-Test and Test Conditions

9.1 Store containers with *F. acarisuga* at 5°C, relative humidity 60 to 90 %, for a maximum of 24 h prior to commencing test. During tests, use temperature of 22 to 25°C and light regime of 16 L:8 D (out of direct sunlight).

10. Sampling

10.1 Specify the number of adults that are expected to emerge from each test unit as indicated on the package before commencing test.

11. Sample Preparation and Treatment

11.1 Total adult emergence is checked over a ten day period. Take a 2 L clear polyethylene bag, prop it open, and adhere one yellow sticky card to the inside top half of the bag, leaving sufficient space at the top for it to fasten. Draw the open end through the air to get as much air into the bag as possible (but do not use your breath to blow it up), then pinch the top of the bag shut and tie a twist-tie far enough down the bag to force the air to inflate the lower two-thirds of the bag. This makes a self-supporting "cage" in which it is easy to observe midges as they emerge. Open the bag and place contents of the *F. acarisuga* shipping container in the bottom of the bag and twist-tie it again so it remains filled with air.

12. Counting Procedure

12.1 Count dead adult midges in the bag and on the surface of the sticky card. Seal the sticky card with the opposite side of the plastic bag for ease in counting and to determine sex ratio.

12.2 *Purity*—During the counting process, check for purity by examining the inside of the bag and surface of yellow sticky card for insect or mite contaminants. If live contaminants are found, identify and record these. Examine empty pupal cases for ragged emergence holes indicating presence of hymenopteran parasitoids and record observations.

13. Sex Ratio

13.1 The sex ratio may be determined by tallying females and males from dead adults on the yellow sticky card from the quantity test. The female midges are easily distinguished from the males as females have short antennae without hairs while males have long curved hairy antennae.

14. Calculation

14.1 The following formula is used to estimate the mean number of insects per test unit:

$$x = \frac{\sum}{n} \quad (1)$$

where:

x = mean number of insects per test unit,
$\sum$ = sum of counts of each test unit, and
n = total number of samples examined.

14.2 *Interpretation of Results*—The mean value of the three test units should be equal to or greater than the number specified on the package.

14.3 No contaminants should be present, however, low numbers of *Tetranynchus urticae* and *Phytosieulus persimilis* would not result in rejection of the product.

14.4 Sex ratio should be equal to or greater than 40 % females.

14.5 If any of above conditions are not met, the shipment is considered below standard.

15. Precision and Bias

15.1 The precision and bias of these test methods have not been determined.

16. Keywords

16.1 *Feltiella acarisuga*; predatory midge; purity; quantity; spider mites; sex ratio