



Designation: E2198 – 02

Standard Specification for *Phytoseiulus persimilis* Athias-Henriot (*Acarina:Phytoseiidae*)¹

This standard is issued under the fixed designation E2198; 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

1.1 This specification covers information on and two test methods for quantification of commercial shipments of the predatory mite, *Phytoseiulus persimilis* Athias-Henriot (*Acarina:Phytoseiidae*), predator of the two-spotted spider mite, *Tetranychus urticae* Koch.²

2. Referenced Documents

2.1 *ASTM Standards*:³

E2200 Specification for Information Included with Packaging of Multi-Cellular Biological Control Organisms

3. Terminology

3.1 *Definitions of Terms Specific to This Standard*:

3.1.1 *carrier*—vermiculite, corn grits, wood shavings, or bean leaves.

3.1.2 *life stage when shipped*—adults and immature.

3.1.3 *name of product*—*Phytoseiulus persimilis* Athias-Henriot

3.1.4 *preferred host prey*—two-spotted spider mite, *Tetranychus urticae* Koch

4. Classification

4.1 *Phylum*—Arthropoda.

4.2 *Class*—Arachnida.

4.3 *Order*—Acarina.

4.4 *Family*—Phytoseiidae.

4.5 *Genus*—Phytoseiulus.

4.6 *Species*—persimilis.

5. Summary of Test Methods

5.1 Test Method A describes a counting method for live *P. persimilis* shipped on vermiculite, corn grits, or wood shavings

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.

Current edition approved April 10, 2002. Published July 2002. DOI: 10.1520/E2198-02.

² Steinberg, S., and Dale, J., "Designing and Implementing Quality Control of Beneficial Insects: Towards More Reliable Biological Pest Control," Sting, Newsletter on Biological Control in Greenhouses, No. 18, July 1998, pp. 26-27.

³ 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.

carrier. Test Method B describes a counting method for live *P. persimilis* per container supplied on bean leaves.

5.2 Number of living *P. persimilis* will be determined by sampling individual containers with *P. persimilis* and estimating total number of live *P. persimilis* and 95 % confidence limits (C.L.) per container. In each container, possible live contaminants will be identified and recorded.

6. Significance and Use

6.1 The efficacy of two-spotted spider mite control by *P. persimilis* depends on accurate release rates of this predator. Accurate packaging and maintenance of viability and purity of *P. persimilis* shipments are, therefore, essential for the effective management of this pest. This test method will be typically employed by producers and users of the product to assess the number of live biological control agents delivered.

TEST METHOD A—Determining the Number of *P. persimilis* per Container Supplied on a Bulk Carrier

7. Materials

7.1 Dissecting microscope or magnifier (10 $\times$), non-toxic white glue or dish detergent, light source, scale (0.00 gr min), mixing container.

8. Test Unit

8.1 A single container with *P. persimilis* is considered a test unit. Minimum three containers per shipment should be chosen randomly from the shipping box.

9. Pre-Test Conditions

9.1 Store the containers with *P. persimilis* between 10 and 12°C, RH 60 $\pm$ 5 %, for a minimum of 1 h and maximum of 24 h prior to examination.

10. Mixing and Weight Recording

10.1 Record the weight of the container with predators. Rotate the contents of the container gently until all predators are removed from the container wall and mixed well with carrier. Pour half of the carrier with predators into a mixing container. Mixing container should be about 4 times larger than container with *P. persimilis*. Mix the remaining contents for a few seconds and empty into the mixing container. Rotate carrier with predators gently for about 15 s so that carrier

always touches container walls. Record the weight of empty container and determine total weight of carrier and predators.

11. Sampling

11.1 Take a minimum of 5 samples per container, each sample consisting of 2 % of carrier weight for 200 to 500 mL containers, or minimum 5 % of carrier weight for <200 mL containers. Make sure that the material is remixed immediately before taking each sample.

12. Counting Arena and Test Conditions

12.1 Pour a thin line of a white glue or liquid detergent to form a circle on white sheets of paper. This will prevent predators from escaping during counting. Spread each sample inside the circle and place under a warm bulb (75 W), positioned about 27 cm above table. The test is typically carried out at the temperature 28 to 30°C.

13. Counting Procedure

13.1 Record all predators running out of the carrier. Add to it the count of live and mobile predators remaining in the carrier. Use counts from the five samples to estimate the total number per container and 95 % C.L. Record and identify any other live organisms in each sample.

TEST METHOD B—Determining the Number of Live *P. persimilis* per Container Supplied on Bean Leaves

14. Materials

14.1 Dissecting microscope or magnifier (10×), ice packs, used newspaper.

15. Test Unit

15.1 A single container with *P. persimilis* is considered a test unit.

16. Pre-Test Conditions

16.1 Store the containers with *P. persimilis* on bean leaves between 10 and 12°C, RH 60 ± 5 %, for a minimum of one hour and maximum of 24 h prior to examination.

17. Counting Arena and Sampling

17.1 Spread several ice packs on the table and cover them with newspaper. Take randomly 10 % of bean leaves from one container and keep the leaves separately on the ice packs until examination.

18. Counting Procedure

18.1 Count the number of predators on upper and lower leaf surface. Check the paper for any predators that have moved off of the leaves and count these as well. Use counts from all samples to estimate the total number per container and 95 % C.L. Record and identify any other live organisms than the predatory mite and its prey, the two-spotted spider mite, *Tetranychus urticae*, in each sample.

19. Calculations and Interpretation of Results for Test Methods A and B

19.1 The following formulas could be used to estimate the total number of *P. persimilis* per container and 95 % C.L.:

- $\bar{x}$ = mean number of adults per sample,
- S.D. = standard deviation of the mean,
- f = fraction of a total contents of vermiculite in one sample,
- df = degree of freedom (number of samples examined per container minus 1),
- n = total number of samples per container, and
- $t_{\alpha(df)}$ = t value from table of “ t ,” two tailed test ($\alpha=0.05$)(2.776 for 4 df).

Estimation of total number of *P. persimilis* per container:

$$\bar{x}/f$$

Estimation of 95 % C.L.:

$$\text{Upper Limit: } (\bar{x}/f) + [(t_{\alpha(df)} \text{ S.D.})/(f \sqrt{n})]$$

$$\text{Lower Limit: } (\bar{x}/f) - [(t_{\alpha(df)} \text{ S.D.})/(f \sqrt{n})]$$

19.2 The number indicated on the label should fall within or below the C.L. bands. When the upper C.L. band is below the number indicated on the label, the shipment is considered below the standard. Some spider mites (*T. urticae*) may be present on the leaves only as they serve as food for *P. persimilis* but no other organisms should be found as contaminants in this test.

20. Product Marking

20.1 Product marking is specified in Specification [E2200](#).

21. Precision and Bias

21.1 The precision and bias of Test Methods A and B has not been determined.

22. Keywords

22.1 accuracy; *Phytoseiulus persimilis*; predator; spider mites