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Phytoseiulus persimilis

Biological Control Agent of the Twospotted Spider Mite

The predatory mite, *Phytoseiulus persimilis*, can be released into greenhouse production systems to manage twospotted spider mite, *Tetranychus urticae*, populations below plant-damaging levels on ornamental and vegetable crops. This publication provides information on the biology, feeding behavior, commercial availability, and use of *P. persimilis* as a biological control agent.

Figure 1. *Phytoseiulus persimilis* adult (Biobest).

Biology

Phytoseiulus persimilis adults are 1/64 to 1/32 of an inch (0.39 to 0.79 millimeters) long, pear shaped, red to orange, and have long legs (Figures 1 and 2). *Phytoseiulus persimilis* is nearly twice as large as the twospotted spider mite and moves rapidly, which increases the ability of the predatory mite to find twospotted spider mites on plants.

Adult females can live up to 50 days. Mated females produce eggs, whereas unmated females do not produce eggs. When temperatures are between 62 and 80 degrees Fahrenheit (17 to 27 degrees Celsius), an adult mated female can lay up to five eggs per day, laying up to 60 eggs during her 50-day lifespan. Females typically lay eggs on plant leaves near populations of the twospotted spider mite.

The optimal temperature for reproduction is between 63 and 82 degrees Fahrenheit (17 to 28 degrees Celsius) with a relative humidity between 60 and 90%. A relative humidity below 60% can reduce egg survival. Six-legged larvae emerge (eclose) from eggs in two to three days. Larvae become eight-legged protonymphs, and then eight-legged deutonymphs. Deutonymphs eventually become adults. The adult female to male ratio is 4:1.

Figure 2. *Phytoseiulus persimilis* adult and twospotted spider mite eggs (Biobest Sustainable Crop Management).

Figure 3. *Phytoseiulus persimilis* populations can spread more easily among a crop when plant leaves are touching (Raymond Cloyd).

The life cycle of *P. persimilis*, from egg to adult, is shorter than that of the twospotted spider mite. At temperatures between 68 and 77 degrees Fahrenheit (20 to 25 degrees Celsius), the life cycle of *P. persimilis* takes four to seven days to complete. Hence, populations of *P. persimilis* can quickly reduce twospotted spider mite populations below plant-damaging levels. The optimal temperatures for managing twospotted spider mite populations are between 59 and 77 degrees Fahrenheit (15 and 25 degrees Celsius). *Phytoseiulus persimilis* is most effective in managing twospotted spider mite populations at 68 degrees Fahrenheit (20 degrees Celsius). Temperatures lower than 54 degrees Fahrenheit (12 degrees Celsius) and above 86 degrees Fahrenheit (29 degrees Celsius), and a relative humidity below 40% can reduce activity and feeding by *P. persimilis*. For example, when greenhouse temperatures are higher than 86 degrees Fahrenheit (29 degrees Celsius) and the relative humidity is lower than 40%, *P. persimilis* populations move down into the plant canopy where temperatures are cooler, and the relative humidity is higher. Consequently, twospotted spider mite populations residing in the upper plant canopy escape predation, and can continue feeding and causing plant damage.

Feeding Behavior

Phytoseiulus persimilis only feeds on the twospotted spider mite. The larvae do not feed, but the nymphs and adults feed on all life stages (eggs, larvae, nymphs, and adults) of the twospotted spider mite. At 68 degrees Fahrenheit (20 degrees Celsius), a *P. persimilis* adult can feed on 10 twospotted spider mite adults, or 20 larvae or eggs per day. Nymphs tend to reside in one location, whereas adults move to other locations on a plant. If twospotted spider mites are not present, populations of *P. persimilis* will eat (cannibalize) each other. *Phytoseiulus persimilis* populations will decrease in the absence of twospotted spider mites. Therefore, additional releases may be required if twospotted spider mite populations rebound.

Figures 4. Containers of *Phytoseiulus persimilis* (Raymond Cloyd).

Effect of Plants on *Phytoseiulus persimilis*

Phytoseiulus persimilis populations can spread more easily throughout a crop when plant leaves are touching (Figure 3). Plant leaves fed upon by twospotted spider mites emit a volatile odor (airborne chemical) that is attractive to *P. persimilis*, which increases the predatory

Figure 5. Sachet or slow-release bag containing *Phytoseiulus persimilis* placed on plant (Raymond Cloyd).

Figure 6. Rotate the container of *Phytoseiulus persimilis* to ensure uniform distribution of the predatory mites inside the container (Raymond Cloyd).

mite's ability to locate twospotted spider mite populations. However, hairs or trichomes on plant leaves can hinder the ability of *P. persimilis* to locate twospotted spider mites, which will affect the management of twospotted spider mite populations.

Commercial Availability and Use in Greenhouses

Phytoseiulus persimilis can be purchased from biological control distributors or suppliers. *Phytoseiulus persimilis* is sold as sealed containers, sachets, or slow-release bags (Figures 4 and 5) that contain eggs, nymphs, and adults mixed with a bran carrier. Release *P. persimilis* early in the production cycle before twospotted spider mite populations become established. In addition, make releases as soon as possible to prevent the predatory mites from eating each other (cannibalism).

When using sachets, place sachets containing *P. persimilis* onto plant stems or branches (Figure 5). If using sealed containers, gently rotate the container on a hard surface (Figure 6) so the predatory mites are uniformly distributed, which will allow the predatory mites, when released, to be dispersed evenly throughout the greenhouse. So predatory mites do not fall off plants, lightly mist plant leaves with water (Figure 7) before releasing (Figure 8). Check plants afterward to confirm that the predatory mites are alive and moving on plant leaves (Figure 9). *Phytoseiulus persimilis* can be mixed in containers with sawdust or bran and applied with a mechanical blower (Figure 10).

Figure 7. Lightly mist plant leaves before releasing *Phytoseiulus persimlis* (Raymond Cloyd).

Figure 9. Checking plant leaves to ensure *Phytoseiulus persimilis* are alive and moving around on plant leaves (Raymond Cloyd).

Figure 8. Distributing *Phytoseiulus persimilis* onto plant leaves (Raymond Cloyd).

Figure10. Mechanical blower used to apply *Phytoseiulus persimilis* throughout the greenhouse (Raymond Cloyd).

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