



## Beneficials: Predatory Mites

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### What you should know

- Predatory mites feed on all life stages of many small arthropods and target pest spider mites.
- Most predatory mite species do best in humid conditions and controlled environments such as greenhouses and high tunnels, although some species such as the western predatory mite tolerate high temperatures and low humidity.
- Predatory mites are commercially available to fit most farm, landscape and garden situations.
- Predatory mites do not damage plants, but feed on plant pollen when prey is unavailable.



**Fig. 1.** Western predatory mite (right) attacking a European red mite (left).<sup>1</sup>

**P**redatory mites can provide natural pest control by eating unwanted pests. These beneficial mites are one way to maintain pest populations at non-damaging levels, known as biological control. By encouraging predatory mite populations, plants can be protected from excessive pest attack and damage.

Mites are arthropods, characterized by having an exoskeleton and jointed appendages among other traits, and are not insects. They belong to the same class as spiders, *Arachnida*. There are over 40,000 recognized species of mites worldwide. The most familiar are the pest mites that feed on plants, such as the two-spotted spider mite, an economically important pest of many crops. There are also many predatory mites that feed on pest mites and small insects.

Predatory mites occur naturally in varied habitats from agricultural fields to small backyard gardens. It is best to encourage native populations through recognized conservation practices. These practices include scouting for pests and predators and using "soft" pesticides rather than broad-spectrum chemicals. Many beneficial species can also be purchased and released. It is crucial to choose the mite species appropriate for the environment. Most beneficial mites prefer higher humidity and lower temperatures than what is common during the summer in Utah. The most common commercially available beneficial species are shown in Table 1 (pg. 3).

The predatory mite that may do best outdoors in Utah is the western predatory mite (*Galendromus occidentalis*). Suppliers may use other names for the western predatory mite, such as, *Typhlodromus occidentalis* or *Mesoseiulus occidentalis*.

### DESCRIPTION

Western predatory mites are very small (about 0.5 mm or 1/50 inch), typically requiring at least a hand lens to see them. The adults are teardrop- or pear-shaped arachnids with four pairs of legs. They do not have antennae, segmented bodies, or wings. Using a microscope, the piercing-sucking mouthparts can be seen sticking out in front of the head. Western predatory mites are smaller or equal in size to most spider mite species. They are also much more active than the slow moving pest mites. Their bodies vary in color from cream to green to red, depending on the color of their recent food source.

### Life cycle:

Predatory mites have five stages in their life cycle—egg, six-legged larval stage, protonymph, deutonymph, and adult. Most beneficial species have a life cycle very similar to what is outlined below.

**Eggs** are oval, clear, larger than spider mite eggs (which are round), and typically laid on the underside of leaves. They are laid individually and the larvae hatch in 2-3 days.

**Larvae** have three pairs of legs (six total) and begin feeding on prey immediately after hatching. After feeding on one or two prey for one or two days they molt to the protonymph stage.

**Protonymphs** and **deutonymphs** are first and second stage nymphs, respectively, that increase in size and have four pairs of legs (eight total). Each stage consumes prey over one or two days, getting slightly larger and eventually molting to adulthood.



**Fig. 2.** Female western predatory mite and eggs (white).<sup>2</sup>

**Adult** females consume about two prey per day for about five to six weeks. They deposit an average of 33 eggs during that time. Males consume about one prey per day for about four to five weeks.

Predatory mites have multiple generations per year and develop from egg to adult in 6 – 12 days. Western predatory mites go into diapause (dormancy) when there are less than 11 hours of daylight. There are, however, non-diapausing strains that can be used effectively in greenhouses during short winter days. Adults overwinter in protected places, such as bark, leaves or soil debris.

### Foraging:

Western predatory mites are quite versatile in that they can be used in low-growing crops such as strawberries, mid-height crops such as grapes and cane fruit, and tree fruit crops. They will attack adult, juvenile, and egg stages of many pests, such as two-spotted spider mites, McDaniel spider mites, yellow spider mites, apple and pear rust mites, Prunus rust mites, blister mites, and sometimes European red mites, making them a fairly versatile generalist predator. They will also feed on other predatory mites and small insects. They consume their prey by piercing and sucking them dry. *Amblyseius* spp. also tend to be generalist while *Neoseiulus cucumeris* target thrips, and *P. persimilis* targets spider mites more specifically.

Many predatory mites supplement their diet with plant pollen, which helps limit their dispersal in the general area where they are resident or released as a biological

control agent. The additional food resource and limited mobility allows predatory mites to act as “body guards” and protect plants from pest mite outbreaks even when pest populations are low.

## PROMOTING BENEFICIAL MITES

### Augmentation and Inoculation:

Predatory mites can be purchased through commercial suppliers and they also occur naturally. Augmentation is the practice of timing the introduction of a fresh population of predators to help the current native population keep up with an observed or anticipated flare-up of a pest population. Inoculation is the practice of introducing predators into an area where the population is low or non-existent.

When pest spider mite populations are high it is better to apply a “soft” pesticide, such as insecticidal soap or horticultural oil, before introducing predators. This should knock the pest mite population down so the predator introduction can be more effective. If a miticide is to be used in a “hot spot” it should be applied before the introduction of the predators—preferably several days before the release. This strategy will improve the effectiveness of the predatory mites. Read the pesticide label to select the product that will best fit the pest management plan. It is important to note that some pesticide-tolerant strains of predatory mites are available as biological control agents.

### Release process:

Several species of predatory mites can be purchased through commercial suppliers (Table 1, pg. 3). Select the predatory mite that best fits the pest management plan (e.g., target pest, greenhouse, etc.). Mites are usually shipped overnight in an insulated container with an ice pack to improve survivability. When the shipment is received it should be opened and inspected as soon as possible to determine whether the mites are still alive.

The mites are typically combined with a carrier material, such as vermiculite, corncob dust, or sawdust. A light spray of water on the application area will help the mites and carrier material stay in place when they are applied to the infested area. It is best to apply them to the field, garden, or greenhouse as soon as possible to ensure their survival. To avoid extreme heat or cold that can decrease predator success, apply them in the early morning or late evening. Be sure to follow the supplier's instructions.

**Fig. 3.** Predatory mites are applied from a shaker container provided by the commercial supplier.<sup>3</sup>



Depending on the predatory species and the pest mite population level, recommendations are for a release of 2000 – 5000 predators per acre. If there are noted “hot spots” of pests it is good to make sure the predators are applied in those areas to help get those hot spots under control.

Predator releases are more successful if early scouting has detected pests before the population gets too high. Begin in spring and check plants weekly for pest and predatory mites. This will require at least a hand lens and a lot of practice.

## Conservation:

Conservation involves practices that encourage native predatory mite populations. Many pesticides are just as, or more, harmful to predatory mites as they are to pest insects and mites. In fact, some pesticides, such as imidacloprid, carbaryl, and malathion, actually promote spider mite growth and/or reproduction while reducing the resident predatory mite population. Often, secondary outbreaks of pest mites result from the mortality of predatory mites following broad-spectrum pesticide applications for control of primary pests. Predatory mites can be conserved by eliminating or reducing pesticides that are toxic to arthropod predators.

Predatory mite adults become active in the spring before the spider mite population emerges. Predators are most likely to become established in perennial flowers, shrubs

and trees. The pollen, small insects and cool-season pest mites in a perennial planting will help maintain a population that is ready to go to work when the pest populations begin to increase. These perennial plantings would be most effective as a border crop or as intercropped strips within the crop area. A diverse habitat of plants will help maintain a healthy beneficial mite population.

## Selected References:

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**Table 1.** Many species of predatory mite are available to purchase. When making a purchase or researching which to use to get the best success, take note of the pest species they attack, preferred plant environment, and optimal temperature and humidity the mite species prefer.

Predatory mite species	Pest targeted	Host plant application	Optimal temperature	Optimal relative humidity (RH)
<i>Phytoseiulus persimilis</i>	Two-spotted spider mite	Low growing plants (strawberries), greenhouse plants	59 – 86°F	At least 60% RH
<i>Galendromus occidentalis</i> (aka <i>Typhlodromus</i> or <i>Mesoseiulus occidentalis</i> )	Spider mites, eriophyid mites, and others but not red mite eggs	Tree fruits, cane fruits, low-growing fruits, corn, cotton	60 – 120°F	Tolerates low humidity, not below 30% RH. Higher temps require higher RH
<i>Mesoseiulus longipes</i>	Spider mites	Greenhouse plants	70 – 100°F	At least 40% RH at 70°F
<i>Neoseiulus californicus</i>	Spider mites, Willamete mite, others	Roses, vegetables, strawberries, corn	55 – 105°F	Prefers humid, tolerates down to 40% RH
<i>Amblyseius fallacis</i>	Two spotted spider mite, European red mite, spruce mite, pacific mite, others	Strawberries, peppers, raspberries, mint, greenhouse plants	48 – 85°F	At least 50% RH

<sup>1,2</sup>Images courtesy of Elizabeth Beers, Washington State University

<sup>3</sup>Image courtesy of Taunton Press, [www.finegardening.com](http://www.finegardening.com)

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