



Amblyseius (Neoseiulus) fallacis

Spider Mite Predator

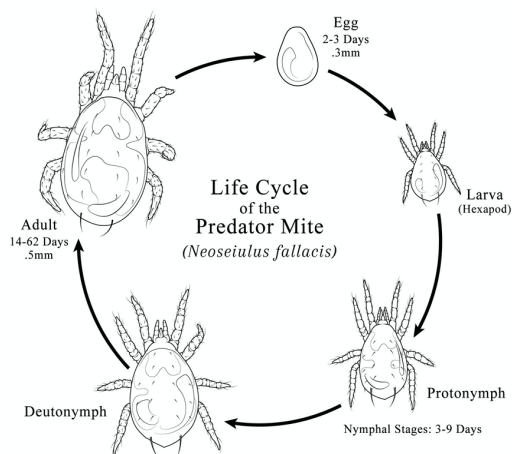
DESCRIPTION:

A. fallacis is a native predatory mite that feeds on spider mites, rust mites, and small insects. It is one of the most important biological control agents in North American berry and orchard crops. Adults have pear-shaped 1/50-inch (0.5 mm) long bodies. They are tan to light orange in color, shiny, and have long legs. Immature predators are cream colored and semi-transparent. Eggs are oval and are 1/64-inch (0.3 mm) long.

TARGET PEST:

Two-spotted spider mite (*Tetranychus urticae*), European red mite (*Panonychus ulmi*), Spruce spider mite (*Oligonychus ununguis*), Southern red mite (*Oligonychus ilicis*), Bamboo mite (*Schizotetranychus celarius*)

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A. fallacis

LIFE CYCLE:

Development from egg to adult takes from 7-9 days at 70°F (21°C) to 3 days at 85°F (32°C). At 78°F (26°C) a fourfold increase in numbers can occur within 4 days; in the field, under optimum conditions, populations can increase from 10 predators/100 leaves to 200-500 predators/100 leaves, in just 2 weeks.

Adult females lay 1-5 eggs per day, for a total of 26-60 eggs over their 14-62 day lifetime. The eggs hatch in 2-3 days. Eggs are oval and twice the size of two-spotted mite eggs. Newly hatched predators do not eat, but later stages and adults feed on all stages of prey. Female *A. fallacis* eat 2-16 spider mites per day.

Adult females enter diapause in response to the short days (daylight of 14 hours or less) in fall. They stop reproducing and move into sheltered areas, such as under bark or ground cover. They do not enter diapause in greenhouses or interior plantscapes if the temperature is 64°F (18°C) or above.

MONITORING TIPS:

Use a headband magnifier or 10-15X hand lens. The predators are usually easy to tell from their prey, which are slow moving. Adult mites often hide under leaf hairs and along the edge of leaf veins. They are most easily seen on parts of the leaf where spider mite numbers are low or around the edges of the main spider mite infestation. Eggs are usually found singly or in pairs in crevices along, or partly under, the leaf midrib or where prey is abundant.

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USE IN BIOLOGICAL CONTROL:

A. fallacis is used to control two-spotted spider mites and other mites on greenhouse peppers, field strawberries, raspberries, currants and mint. In British Columbia, Washington and Oregon, IPM programs for field berry crops are based on using *A. fallacis* as the primary control for spider mites.

A. fallacis is also used on container and field-grown nursery stock. Research in Oregon found that *A. fallacis* can control the spider mites *O. ilicis*, *O. ununguis*, and *T. urticae* on woody ornamentals (*Thuja*, *Skimmia*, *Weigela*, *Potentilla*, *Euonymus*, and *Buddleia*) and bamboo mite (*Schizotetranychus celarius*). *A. fallacis* feeds on apple rust mite (*Aculus schlectendali*), cyclamen mite (*Steneotarsonemus pallidus*) and tomato russet mite (*Aculops lycopersici*), however, whether or not it controls these species is not known.

A. fallacis is more resistant to pesticides than most biological controls and a strain highly resistant to pesticides is available commercially (see below).

Unlike other predatory mites, such as the *P. persimilis* predatory mite, *A. fallacis* can remain in areas with low levels of spider mites; they survive in the absence of mite prey by feeding on other small arthropods and pollen. *A. fallacis* feeds and reproduces over a wide range of temperatures 48-85°F (9-32°C). They do best where there is a dense plant canopy and when relative humidity is over 50%. *A. fallacis* can reproduce at lower temperatures than other predatory mites (*Phytoseiulus persimilis*, *Neoseiulus californicus*) and displaces them in the cooler growing areas in Canada and northern USA.

PRODUCT INFORMATION:

A. fallacis is available commercially either on bean leaves or in a granular carrier (usually vermiculite, sawdust or corn grits). These formulations should be applied as soon as possible. *A. fallacis* packages can be held at 50-60°F (10-15°C), out of direct sunlight, for 1-2 days—but storage for longer periods may reduce quality (reduced egg production).

Using the Bean Leaf Product:

Place leaf pieces from the container onto infested leaves of crop plants. The bean leaves eventually dry out and become inconspicuous. Check the product by examining the underside of some of the leaves using a 10-15X hand lens or magnifier. Active predators should be visible. Advantages of this product are that all life stages are present, which introduces all ages of predators into a crop. It also provides ideal humidity and a food supply for the predators in transit. Note that although the bean leaves may contain a few two-spotted mites, this does not add to the pest problem because the predators quickly eliminate them. The presence of this food enables *A. fallacis* to become established and start reproducing immediately, which improves biological control.

Using the Vermiculite Product:

Lay the container on its side at room temperature, out of direct sunlight, for 1/2 hour. Check the product by looking through the bottle or by sprinkling some of the vermiculite onto a sheet of black paper and using a 10-15X hand lens or magnifier. Active mites should be visible. Gently rotate the bottle to mix the mites with the carrier and distribute the contents over the infested plants.

INTRODUCTION RATES:

A. fallacis is most effective when applied at the first sign of a mite infestation. *A. fallacis* will usually become established in the crop after one introduction, where they remain if mites or pollen are available for food. When prey become scarce, *A. fallacis* moves to the top of the plant and usually disperses throughout the crop on air currents or the wind. When predators are found on each infested leaf it usually means that the biological control program will be successful. It may take another 2-6 weeks for new plant growth to show improvement, depending on growth rates.

General Introduction Rates:

0.1-0.5 *A. fallacis* per square foot
For greenhouse crops, apply predators to all infested plants. Use the lower rate for preventative introductions onto mite susceptible

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plants; use the higher rates if there are established mite populations.

Greenhouse Peppers:

As soon as flowers have pollen, or spider mites are present, apply 1 predator/5 plants. Also, apply *P. persimilis* to all outbreak areas when using *A. fallacis* because spider mites can reach high densities on this crop during hot weather. Research in British Columbia has shown that better control of spider mite can be achieved when both *A. fallacis* and *P. persimilis* are used together on greenhouse pepper.

Woody Ornamentals & Container Plants:

Apply 0.1-0.5 predators per square foot to all spider mite susceptible plants early in the season, or as soon as spider mites are detected. Use higher rates for established spider mite populations. Use a compatible miticide, such as Vendex, to treat "hot spots" until the *A. fallacis* populations build up.

Field Crops:

Before introducing *A. fallacis*, monitoring counts should be done to determine numbers of spider mites and existing predators. Spread *A. fallacis* evenly throughout the field using 150-200 release points/ha (60-80/acre); concentrate extra predators where there are higher mite counts.

- Strawberries and Mint: For new plantings release 10,000 predators/acre (25,000/ha) as soon as possible after planting or 10 days after applying insecticides to control aphids. On producing fields, release 7000/acre (17,000/ha) if needed in spring or early summer so predator numbers have enough time to build up and provide control before September. Before planning a strawberry biocontrol program, refer to the Oregon State University web site, which includes a *A. fallacis* release rate calculator (<http://www.orst.edu/Dept/entomology/ipm/mcalc.html>).

- Raspberries and currants: Release 7,000-10,000 predators/acre (17,000-25,000/ha). Inoculate only those fields with spider mite populations of 0.3 mites/leaf and higher. Release predators early in the spring to achieve control

the same season; release them during the summer for control the next season.

FOR BEST RESULTS:

In field crops, placing higher numbers of predators on the prevailing upwind side of the crop will increase their dispersal throughout the crop by wind.

In greenhouses, *P. persimilis* should always be applied along with *A. fallacis*. If spider mite numbers are high (there is visible webbing and clusters of mites stringing down from leaves), use an integrated pesticide, such as fenbutatin oxide (Vendex®) or insecticidal soap, to reduce pest numbers before releasing predators and in hot spots after release.

A. fallacis needs relative humidity of over 50% to survive, particularly in the egg stage. In hot, dry conditions, raise the humidity by watering or misting plants. For two-spotted mites in greenhouses, where temperature and humidity are consistently high [over 72°F (22°C) and 70% RH], release *P. persimilis* as well as *A. fallacis*. *P. persimilis* works better in high-density spider mite populations under these conditions. (For more information, see *P. persimilis*). Where over 60% relative humidity can be maintained, both *P. persimilis* and the predatory midge *Feltiella acarisuga* (see Mite Predators) can be used with *A. fallacis*. The mite eating lady beetle, *Stethorus* (see Mite Predators) is less affected by low humidity and may be used along with *A. fallacis* on greenhouse cucumber, pepper, and nursery crops. *Stethorus* is able to fly and can detect and control small colonies of mites before they become well established.

USING CHEMICALS:

For effect of pesticides on *A. fallacis*, contact Sound Horticulture and see below for resistant strains information.

To reduce mortality of predatory mites from pesticides, release predators 10 days after spraying. The pesticide fenbutatin oxide (Vendex®) can be used with *A. fallacis* for additional control of spider mites if "hot-spots" develop. It does not harm *A. fallacis*, but avoid

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over spraying, which reduces the predator's food supply and their ability to reproduce. Spreader-stickers, supreme oils, and soaps are harmful to predators contacted by the spray, but have little residual activity.

Pesticide Resistant Strain of *A. fallacis*:

A special strain of *A. fallacis*, selected by H. Thistlewood (Agriculture and Agri-Foods Canada, Vineland Research Station) for resistance to commonly used pesticides is mass-produced under license by Applied Bio-Nomics Ltd. in Canada. When the following pesticides are used at low rates they are of low to moderate toxicity to this strain on *A. fallacis*. Breeding populations of *A. fallacis* should survive in the crop when the pesticides listed below are used at low label rates. Check with Sound Horticulture before using other chemicals.

abamectin (Avermectin) azinphos-methyl (Apm/Guthion) Bacillus thuringiensis (Dipel) captan (Captan) clofentazine (Apollo) diazinon (Diazinon) dichlone (Phygon) diflubenzuron (Dimilin) endosulfan (Thiodan) fenarimol (Rubigan) fenbutatin oxide (Vendex/Torque) fenoxycarb (Sustain/Insegar) hexythiazox (Savey) iprodion (Rovral) malathion (Malathion) methoxychlor (Methoxychlor) mycobutanil (Nova) mineral oil (dormant oil) phosmet (Imidan) pirimicarb (Pirliss) propargite (Omite) sulphur (Sulphur) triadimefon (Bayleton) triforine (Funginex) vinclozolin (Ronilin)

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