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Mites

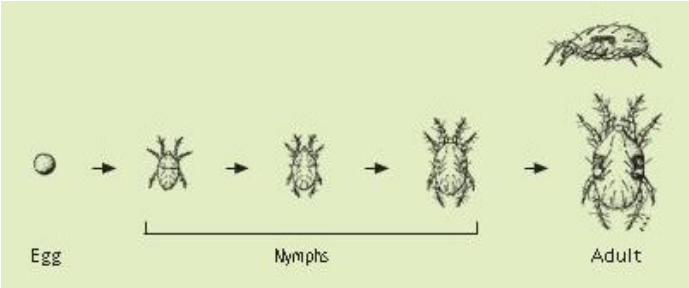
Mites are one of the most prolific groups of arthropods. They can be found both indoors and outdoors in crops, both as plant pests and also as natural enemies of other pests. Because of their small size, they are not often seen until damage symptoms have become severe, at which time the number of mites present is already very high.

Two spotted spider mite (TSM)—*Tetranychus urticae*

Two spotted spider mite, (also called red spider mite) is a major pest in vegetable, fruit, flower and ornamental crops both indoors and outdoors all over the world.

Life-cycle and appearance

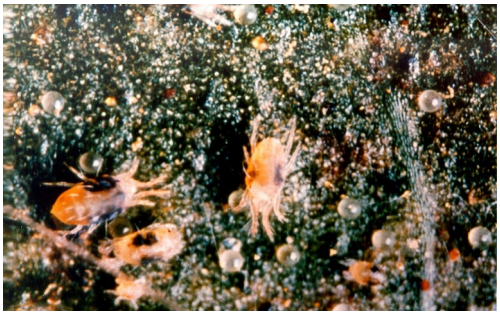
TSM has five stages in its lifecycle - egg, larva, first nymphal stage (protonymph), second nymphal stage (deutonymph) and adult mite.



Life cycle of two spotted spider mite

The eggs of the spider mite can mostly be found on the underside of the leaf. They are round, have a diameter of about 0. 14 mm and are transparent in color just after being laid. Later they become opaque. By the time the larva emerges the egg is straw-colored. Larvae have three pairs of legs and at emergence are colorless with two dark red eyes. After feeding on plant tissue their color changes to light green, brownish yellow or dark green. At that stage two dark spots appear in the middle of the body.

Protonymphs have four pairs of legs and are slightly bigger than the larvae. Their color varies from light to deep green. Their two body spots are bigger and clearer than on the larvae. After a period of eating, the protonymph rests and then develops into a deutonymph. This nymph is bigger, but has a similar coloring to the protonymph. Once it has become a deutonymph, differences can be seen between males and females. An adult mite develops from the deutonymph once it has had a feeding and a resting stage.



Adults, juveniles and eggs of the two spotted mite

The adult female two spotted mite is oval-shaped and rounded at the rear. The color can vary from orange, light yellow or light green to dark green, reddish brown or even black. The male is more active than the female. His body is smaller and more pointed at the rear. His coloring varies from light yellow or orange to dark yellow or brown. Often the color of adult mites depends on the crop on which they occur. For example, the mite may be yellowish brown on cucumber, but reddish brown on tomato. Both males and females usually have two large black spots on each side of the body, which can vary in size and shape. In summer the female can be a bright red colour, and there can also be an orange overwintering form.

A spider mite population consists of about 75% females and 25% males.

Males often hang around females in the last stage of development in order to mate with them as soon as they become sexually mature. One single mating is sufficient to fertilize all the eggs. Fertilized females produce females as well as males, whereas unfertilized females produce only males.

Normal colour form

Depending on the temperature it takes 0. 5 to 3 days for the female to start depositing eggs. The number of eggs she lays per day and the number of days she produces eggs depends on a number of factors:

- the temperature,
- the crop,
- the humidity,

- plant nutrition
- and exposure to pesticides.

Under ideal conditions a female can lay more than 100 eggs.

All life stages of two spotted mites (except eggs) can cause damage to the plant. Mites mostly appear on the underside of the leaves where they pierce plant cells and suck out their contents. Those cells then turn yellow, and on many plants the damage caused by the mites can be seen on the upper surface of the leaf as small white yellow spots. With increasing damage the leaves turn completely yellow or brown. With the photosynthetic area gone the leaf dies and the whole plant can eventually die. Nymphs and adults also produce webs. If large numbers of mites are present, the plant can be covered completely with webs which are swarming with mites.

Webbing on a developing cucumber plant

For plants this can have the following effects:

- ♦ the chlorophyll is destroyed or disappears. Photosynthesis and therefore plant growth decreases. Crop losses occur on tomato and cucumber when about 30% of the leaf surface is damaged;
- ♦ the spots on the leaves/flowers and the webs damage the appearance of the crops, This is especially important for ornamentals, and flower crops

Measures like fertilization and pruning to improve crop growth can also improve the quality of the food source, and thus promote faster reproduction of the pest.

Because of it's fast development, high reproduction rate and pressure from chemicals, two spotted mites are able to quickly develop resistance to many miticides.

The regular use of pesticides can inhibit the use of natural enemies and the use of some insecticides (such as Imidacloprid) increases the egg laying capacity and reproduction rate of two spotted mites. Climate control (e.g. low humidity for the prevention of mildew in greenhouse roses/cucumbers) can inhibit the effectiveness of natural enemies, allowing pest numbers to spike.

Two spotted mite damage on strawberries

Two spotted mites can infest or travel to the crop in several ways.

- ♦ when a plant is heavily infested, mites will congregate at the top of the plant. Mites sometimes fall to the ground, after which they spread or they move along crop wires to other plants.
- ♦ they can also spin silk threads which they use to release themselves from the plant surface, and then can be moved to new sites by air currents and wind.
- ♦ they can be dispersed by infected plant seedlings, on machinery, workers hands or clothing, birds etc.

Control with *Phytoseiulus persimilis* (Persimilis), *Neoseiulus californicus* (Californicus) or *Typhlodromus occidentalis* (T.o's)

Bean Spider Mite—*Tetranychus ludeni*

Commonly known as the dark-red spider mite, red-legged spider mite or bean mite, this species is found on over 300 plant species world wide including bean, eggplant, hibiscus, pumpkin and other cucurbits in warm areas. It is a common pest on greenhouse crops in temperate areas.

Eggs are usually laid on the underside of leaves, are spherical in shape and pale yellow in colour. Adults are dark crimson red but lack the two dark spots that two spotted mites have. Legs are often dark red as well. This species is very similar in general appearance to *Tetranychus cinnabarinus*.

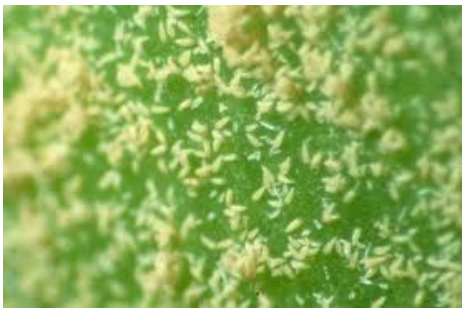
The life cycle of the bean spider mite is very similar to that of the two spotted mite.

Control with *Phytoseiulus persimilis* (Persimilis), *Neoseiulus californicus* (Californicus)

Bean spider mites and eggs

Tomato russet mite—*Aculops lycopersici*

The tomato russet mite (or tomato rust mite) can be a major pest of greenhouse tomatoes, eggplants and outside on potatoes and solanaceous weeds such as blackberry nightshade. The mite is easily spread on workers clothing, wind and leaves blown into a crop from outside. These mites are tiny <180µm and are difficult to see even with a 20 x hand lens. By the time the first symptoms are seen on plants, mite numbers are already very high. Most infestations start on the lower parts of the plant. Lower leaves start to yellow from the base of the leaf moving out towards the edge of the leaf. Leaves may turn silvery on the lower surfaces and curl before final-



Tomato russet mites—more than 20x magnification

ly turning yellow then bronze and dropping off. Infested stems change colour from green to bronze or blackish, and may develop longitudinal cracking. In very heavy infestations, young fruit may show russeting on their surface and fail to expand and have the appearance of rust coloured dust around the calyx. Russet mite feeding may reduce the plants ability to photosynthesise. Russet mites have a lifecycle of approximately 7 days at 21-25°C. Ideal conditions for russet mite development are 21-27°C and 30% relative humidity. Females can live for several weeks and lay up to 50 eggs.

Russet mite damage on tomato leaves

If russet mites are a problem in the greenhouse, make sure any pruned plant material is placed in a plastic bag, sealed and removed as soon as possible from the crop to avoid spreading the mites further. Infected areas should always be worked last in the day to prevent spreading mites from infected to clean areas.

No biocontrols are available for this pest on tomatoes.

Broad mite —*Polyphagotarsonemus latus*

A wide range of hosts are attacked, including many tropical and subtropical fruit, cotton, greenhouse crops such as capsicums, eggplants, chillies, ornamentals and leafy vegetable crops such as spinach or silverbeet. Broadleaf weeds are a significant source of infestations in orchards.

Adult broad mite and eggs

In lemons it causes a silvering of immature fruit. Normally fruit on the shady side and within the tree canopy are the most affected. Damaged fruit take on a silvery white to pale yellow-brown scab-like appearance. The mites also attack the leaves, usually those close to the growing point. Damaged leaves are curled and twisted, sometimes to such an extent that the growing point remains undeveloped, and flowering inhibited.

In capsicums and eggplants, broadmite attacks the young buds with succulent leaves, causing the latter to curl and eventually fall off. On the undersurface of infested leaves corky brown patches may occur.

Broadmite damage on a capsicum head

The adult female mite is white or pale yellow, oval-shaped and 0.2 mm long. The male is smaller, with longer hindlegs, and is more active. A distinguishing feature of broad mite is the male's habit of carrying pre-adult females on their backs in a "T" shape until they are sexually mature. Another identifying characteristic is the appearance of the eggs, which are dome shaped, translucent, and covered with white 'studs' or tubercles.

Development from egg to adult can take 4 to 5 days in summer and 7 to 10 days in winter, so there can be between 20-30 generations per year. The female lives about 14 days, during which time she can produce over 40 eggs. The eggs are laid in indentations on the leaf or on the fruit surface and are attached by their base. These mites thrive in warm humid conditions. The females and larvae do not normally walk from one leaf to another but the males carry the sedentary female pupae from damaged to undamaged leaves and fruits.

Broadmite damage on a capsicum fruit

Broadmite can be spread by other associated flying pests such as whiteflies.

Broadmite controls include *Amblyseius (Neoseiulus) cucumeris* and *Neoseiulus californicus,*

The life cycle can take 10-14 days in greenhouse situations or up to 3 weeks outdoors. Females will lay a total of up to 20 eggs in her life time. They are easily dispersed on the wind, insects, movement of staff and other animals moving through a crop. They prefer dark, moist conditions.

Biological controls include *Neoseiulus (Amblyseius) cucumeris*, and *Neoseiulus californicus*

Bulb mites—*Rhizoglyphus echinopus*

Bulb mites attack bulbs and roots of many species, including *Freesia*, *Dahlia*, *Gladiolus*, hyacinth, lily, iris, *Narcissus* and tulips.

Bulb mites have an oval body shape (approx. 600-940 µm long) and are translucent with a shiny appearance. Their legs are short and reddish brown. Eggs are shiny, clear and oval shaped and are about 1/2 the size of the adult mite.

Bulb mites on a flower bulb

The mite generally attacks through basal plate of the bulb, or though the outer skin layers. If a bulb is bruised or damaged in any way or infected with a disease such as fusarium, mite development occurs more quickly. Damage appears on the roots of *Freesia* and *Gladiolus* as dark brown streaks and the

roots may also be "mined" internally. Corms or bulbs grown in bulb mite infested soils will have distorted leaves and growing points. High numbers of bulb mites can quickly transform an entire bulb to a rotten pulp.

Bulb mites can be effectively controlled by *Hypoaspis aculeifer*.

Snake mites—*Ophionyssus natricis*

Snake mites

Snake mites are parasitic mites commonly found on snakes, but also occurring on captive lizards, turtles, crocodiles and other reptiles. Feeding causes the bodies of the mites to be engorged with blood from the reptile.

Clinical signs include anorexia, depression, frequent rubbing against cage furniture, increased sloughing, and prolonged soaking in the water bowl. Mites may be seen crawling on the skin of the snake. With heavy infections anaemia can occur.

The mites feed by puncturing through the snake skin which can provide a point of entry where diseases such as *Aeromonas spp.* and Inclusion Body Disease (IBD) can be transmitted. Snake mites have been shown to act as vectors for IBD.

There are five life stages for the snake mite: egg, larva, protonymph, deutonymph and adult. The intermediate stages (larva, protonymph and deutonymph) must moult at least once to develop into the next stage. The ideal conditions for the mite to fully develop into an adult are at temperatures between 24-29° C and a relative humidity of 70-90%. The life stages can usually be completed in 13-19 days. Unfavourable environmental conditions will slow or halt development and decrease survivorship of all stages of the mites. All mite stages are killed when exposed to temperatures above 41° C or below 2° C for several days. In terms of humidity, the mites will desiccate at levels below 20%. The mites will also drown if they are kept immersed in water.

Snake mites on a snakes head

After hatching, the young mites go through a larval stage, which takes one or two days. The larvae do not tend to move very far away from the eggs, despite having the ability to walk. They do not feed in the larval stage.

The larvae develop into the protonymph stage, which can last three days to two weeks. At this stage the protonymphs become attracted to the smell of snakes and require a blood meal to go into the next stage. The protonymphs tend to walk around the scale surfaces and head plates of the snake.

The deutonymph stage takes place after a blood meal, usually away from the snake. Again, no feeding occurs while in this stage. Deutonymphs can survive for up to 31 days without feeding. Final moulting takes about a day to complete before the deutonymph becomes an adult mite. Adult mites continue to feed on the host and usually live for up to 40 days.

Once adults, the mites suck blood to engorgement (which takes four to eight days) and then lay approximately 20 eggs. Adult females feed two to three times at one to two week intervals and can lay up to 60-80 eggs in a lifetime. The eggs (off white to tan colour) are rarely laid on the snake, but are usually laid in dark and humid areas. Eggs laid at 25° C will hatch in 2-3 days, provided there is at least 85% humidity.

Snake mites are controlled by *Hypoaspis miles.*

Chicken mites—*Dermanyssus gallinae*

Blood engorged adult chicken mite

The chicken mite (also known as poultry red mite, red fowl mite, red poultry mite, roost mite) is a parasite that occurs world wide and can infest both domestic and wild bird species. It has also been known to attack humans and recent evidence shows it can complete it's life cycle on humans as well.

Chicken mites mainly affect laying hens. Adult female mites lay their eggs in hiding places such as cracks and crevasses in hen houses and enclosures. Four to eight eggs are laid at a time, up to a total of 25 during the mites life time, and usually hatch2-3 days after being laid. The hatched larvae do not feed, but molt into nymphs 1-2 days later. Nymphs need to have a blood feed and after several molts, they become adults (approx. 4-5 days). The mites favour hot humid conditions and in these situations, mites can complete their life cycle in as few as 7 days. Adult mites live for up to 8 weeks but are able to survive for up to 5 months without feeding. In cooler temperatures, development of the mites slows down and is almost stopped at 9°C. Because of this, mite problems are usually more prevalent in the summer months on birds kept outdoors, but can be all year round on birds kept indoors.

Cluster of chicken mites in a hen house

Adult mites can grow to 1mm long and are a white/grey colour if they have not yet had a blood feed, or are dark red after a blood feed. Mites generally feed at night time, and after a blood feed, mites will leave their host and hide in cracks, hollow places on roosts, feed troughs close to the birds. Mites will often be found clustered in these areas, and may number in the thousands. When population numbers get very high, the mites may feed on birds during the day as well as the night. Mites are generally found around the beak, ears, back, legs and breasts of

birds. The mite bites cause itching and inflammation of the skin and when infested, skin on the birds legs may become, crusty and scaly. When infested, birds will often scratch and bite at themselves, causing injury and feather loss. Severe blood loss can cause anaemia and even death. Decreased egg laying in poultry houses can occur and infected birds become more susceptible to other diseases.
Red poultry mites are controlled by *Hypoaspis aculeifer*

Tropical fowl mites—*Ornithonyssus bursa*

"Tropical fowl mites" or "Starling Mites" are common names for the bird mite *Ornithonyssus bursa.* These mites are often incorrectly referred to as 'bird lice', particularly within the pest control industry. Bird mites are most active during Spring and early Summer.
Ornithonyssus bursa is a small but extremely mobile mite, barely visible to the eye, with eight legs (except the larva that has 6), oval in shape and with a sparse covering of short hairs. It is a parasite, which feeds on the blood of common birds including poultry, pigeons, starlings, sparrows, Indian mynahs, and some wild birds. Bird mites are semi-transparent in colour, which makes them difficult to detect on skin until blood is ingested and then digested; when they may appear reddish to blackish.

Tropical fowl mite adult

Contact with humans usually occurs after birds gain entry to roof cavities via broken tiles or through unprotected eaves, of homes, factories, barns and other dwellings to construct their nests in early spring or summer. However, some infestations also occur from birds roosting on the outside of dwellings such as window ledges or awnings. The mites feed on the unfeathered nestlings, as well as the adult birds, and the large amount of nesting material used by the birds provide the mites with an ideal environment in which to thrive. The mites have a short life cycle (approximately 7 days) and can rapidly generate large populations.

When the young birds leave the nest, or die, many mites (often many tens of thousands) are left behind in the absence of a suitable host, and these will disperse from the nest into and throughout the dwelling searching for new hosts. Most mites will die within 3 weeks without a blood meal from a bird host. They will bite humans they encounter but cannot survive on humans.

There are no known biological controls for tropical fowl mites