

Twospotted and Lewis Spider Mites in Strawberries

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Twospotted spider mite life stages and Lewis spider mite adult (extreme right). Photos by Surendra Dara

A few species of spider mites infest strawberries grown on the California coast. The twospotted spider mite, *Tetranychus urticae* is a common species and considered a major pest. Lewis mite or Lewis spider mite, *Eotetranychus lewisi* is another spider mite species that feeds on a variety of host plants was recently found causing heavy infestations in strawberries and raspberries in Ventura County. Both species look very similar in general appearance except that when adult females are compared, Lewis mites are smaller than twospotted spider mites and have several small spots on their body while twospotted spider mites have a single dark spot on either side of the body.

	Twospotted spider mite	Lewis mite
Host range	Multiple hosts. Pest of field crops and greenhouse plants.	Multiple hosts. Mainly greenhouse pest. AKA Poinsettia spider mite
Male	Wedge-shaped, 0.3 mm	Wedge-shaped, mustard colored. 0.25 mm
Female	Oval, 0.4-0.5 mm Single dark spot on either side of the body 	Oval, 0.36 mm Multiple small spots 
Life stages	Egg, larva, protonymph, deutonymph, and adult	Egg, larva, protonymph, deutonymph, and adult. Males have only one nymphal stage.
Egg	Round, clear to whitish	Round, pale-greenish to light orange
Egg laying	About 100 eggs in 10 days	About 60-90 eggs in a month
Life cycle duration	5-20 days	12-14 days at 70°F
Diapause	Ceases reproduction during cold winters	Continuously reproduces without diapause
Damage	Feeds undersurface of leaves. Causes yellow mottling, scarring, bronzing and leaf fall off	Similar, in general, but needs to be determined on strawberries
Webbing	Prominent	At high infestation levels
Predatory mites	<i>Phytoseiulus persimilis</i> , <i>Neoseiulus californicus</i> , <i>N. fallacis</i> , <i>Amblyseius andersoni</i> , etc.	<i>N. californicus</i> , <i>N. fallacies</i> , <i>A. andersoni</i> , etc.

Biology: Life cycle of spider mites includes eggs, larva, protonymph, deutonymph and adult stages. Larvae have three pairs of legs while nymphs and adults have four pairs. They have multiple generations during the strawberry growing season and duration of the life cycle varies depending on temperature.

Damage: Damage by twospotted spider mite appears as stippling of yellow spots that advances into scarring and bronzing of leaves. Severe damage stunts plant growth and can result in plant death. Fall-planted strawberries are very sensitive to mite damage within 2 to 5 months after transplanting. Infestation of more than 1 mite per leaflet can result in measurable yield reduction during this period. Plants are less sensitive to mite damage after initial berry set. However, substantial losses can occur with 15-20 mites per mid-tier leaflet during this period. Highest infestations can be seen after peak spring harvest after which populations rapidly decline. Damage symptoms of Lewis mite on strawberries are yet to be determined.



Twospotted spider mite damage. Browning (left two) to dying (right) of the damaged leaves.

Photos by Surendra Dara

Risk factors: Early build up of mite populations results in season-long damage. Fall plantings are generally more susceptible than summer plantings. Day-neutral cultivars are also more susceptible than short-day cultivars. High carbohydrate and leaf nitrogen or low phenol content is known to increase mite numbers in some hosts. Proximity to second year plantings with mite infestation, presence of infested fields upwind, inadequate chilling of day-neutral varieties, dusty conditions and water stress are some other factors that contribute to mite problems.

Sampling: Depending on the region and time of the year, monitor for mites every week or every other week. When populations are low or when monitoring a small acreage field, check for the presence or absence of mites by randomly sampling 10 midtier leaflets per acre. When infestation is high, 5-10 leaflets per acre can be randomly sampled for counting mites. Economic threshold during the first four months is 5 mites/mid-tier leaflet for fall planting and 10 mites for summer planting.

Management options

- Thorough and regular monitoring is important to make treatment decisions.
- Promote vigorous plant growth through adequate chilling, water and fertilizer management.
- Avoid excessive nitrogen as it may increase mite infestations.
- Use low fences, drive slowly and water roadways to prevent dusty conditions.
- Avoid practices that disrupt natural enemy populations and use miticides that are safe to natural enemies.
- Alternate chemicals with different modes of action to reduce the risk of resistance development where strawberries are continuously grown.
- If you suspect mite resistance to a particular chemical, do a simple test before spraying. Prepare a small quantity of the chemical to be sprayed at a concentration equal to the field application rate. Dip a mite-infested leaf in the liquid, let it dry and then keep it in a container or a bag in a cool, dry place. For comparison, dip another mite-infested leaf in normal water and keep it separately. Observe the leaves one and two days after the treatment. Depending on how many mites are dead on treated leaf compared to the control (water treatment), the effectiveness of the chemical can be determined.
- Conserve or release natural enemies like predatory mites. *Phytoseiulus persimilis* is a specialist predator and is effective early in the season. *Neoseiulus californicus*, which tolerates warmer temperatures and a wide range of humidities, is a generalist predator and a predominant species later in the season. There are several other natural enemies like minute pirate bug (*Orius tristicolor*), a small, black lady beetle (*Stethorus* spp.), a small, black rove beetle (*Oligota oviformis*), big-eyed bugs (*Geocoris* spp.), brown lacewings (*Hemerobius* spp.), green lacewings (*Chrysopa* spp.), six-spotted thrips (*Scolothrips sexmaculatus*), damsel bugs (*Nabis* spp.), a cecidomyiid fly maggot (*Feltiella acarivora*), and a predaceous midge.

Predatory mites: If predatory mites are released after a chemical spray, wait until residual toxicity diminishes. If

releasing *P. persimilis*, use 40,000-60,000/acre when spider mite populations are limited to localized areas and 30,000/acre when spider mites are well distributed, but present at low numbers. If spider mite populations are increasing 100,000 or more *P. persimilis* may be released per acre. This predator is effective early in the season when temperatures are cool. Later in the season, *N. californicus* becomes a predominant species whether or not released and is better suited for warmer temperatures.

Chemicals and their modes of action: Chemicals are placed in different groups based on their modes of action.

Affect nervous system:

Acetylcholinesterase (AChE) inhibitors—Organophosphates (1B): Chlorpyrifos (Lorsban), diazinon-foliar, malathion, naled (Dibrom)

GABA-gated chloride channel antagonists (2)—Cyclodiene organochlorines (2A): Endosulfan (Thionex, Thiodan)

Sodium channel modulators (3): Bifenthrin (Capture, Brigade), fenpropathrin (Danitol)

Chloride channel activators (6): Abamectin (Agri-Mek)

Non-specific mode of action:

Mite growth inhibitors (10): Etoxazole (Zeal), hexythiazox (Savey)

Neuronal inhibitors (25): Bifenazate (Acramite)

Affect metabolic processes and respiration:

Mitochondrial complex III electron transport inhibitors (20): Acequinocyl (Kanemite)

Mitochondrial complex I electron transport inhibitors (21): Fenpyroximate (Fujimite)

Inhibitors of lipid synthesis (23): Spiromesifen (Oberon)

Other modes of action: Cinnamaldehyde (Cinnacure), insecticidal soap (M-Pede), paraffinic oil (JMS Stylet Oil), petroleum oil, rosemary oil (Hexacide)

Biological control of Lewis mites:

To understand the interaction among, twospotted spider mite, Lewis mite, and predatory mites, laboratory bioassays were conducted in Ventura by Oleg Daugovish and Anna Howell. Predatory mites *Neoseiulus californicus*, *N. fallacis*, and *Amblyseius andersoni* effectively controlled Lewis mites in the preliminary bioassays.

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