

Two-Spotted Spider Mites in Berry Crops

A BC Small-Scale Farmer's IPM Guide- *Guide series, March 2021*

Two-spotted spider mites (TSSM; *Tetranychus urticae* Koch) feeds directly on plants and can cause damage on a broad range of crops, including strawberries, raspberries, blackberries, eggplants, and cucumbers. They can cause serious yield loss in high infestations. They are typically a concern later in the season as they thrive in hot and dry conditions. This manual contains integrated pest management (IPM) guidelines geared towards small-scale production, but they are applicable to any operation wanting to improve pest identification, monitoring and management.

Identification

Eggs:

- Minute, spherical and shiny.
- Colourless to straw-colored.
- Laid on underside of leaves.

Larvae:

- Six-legged.
- Colourless.
- Resemble the nymph and adult but smaller.

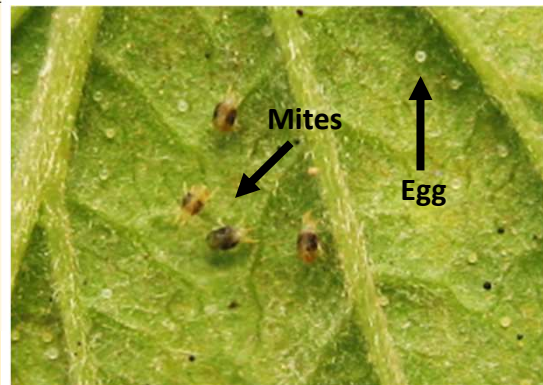


Adults:

- Adults are about 0.5 mm long.
- Eight-legged.
- Pale tan coloured with two black spots (one on each side).
- Lay up to 200 eggs.

Nymphs:

- Eight-legged.
- Slightly smaller than adult.
- Resemble the adult: Pale tan coloured with two black spots (one on each side).



TSSM overwinter as adults

- They are orange-red coloured when they emerge in the spring and when preparing to overwinter in late summer/early fall.



Damage Identification

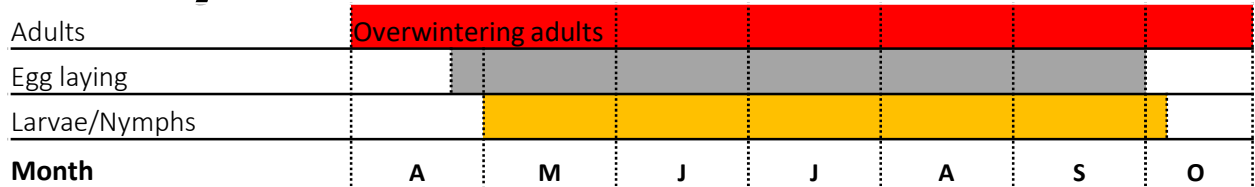
Two-spotted spider mites feed on plant cells with their piercing and sucking mouthparts. They mostly feed on the undersides of the leaves, however the damage is visible on both sides of the leaves.

Look for:

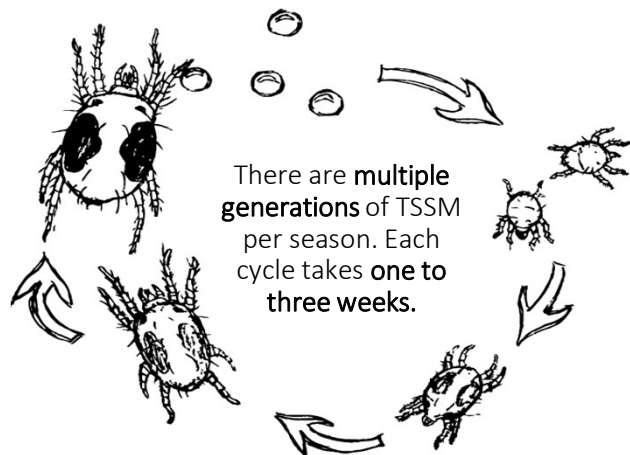
- Tan to yellow specking or mottling on leaves.
- Webbing on the underside of leaves, then look for mite colonies.
- Large populations produce webbing that completely covers the leaves or flowers and can result in plant death.



Lifecycle



Under optimal conditions (27 °C and dry), eggs can hatch in 3 days and become mature egg-laying adults in 5 days. This makes timeliness in monitoring and action very important for this pest.



How to Monitor

Monitoring is a very powerful tool for this pest!

Decision making is based on tracking changes in multiple factors over time.

- Prioritize field edges – edges and corners are the most common starting points for TSSM infestations.
- Don't just look for webbing – webbing can persist without active mites, so always look for eggs and living mites.



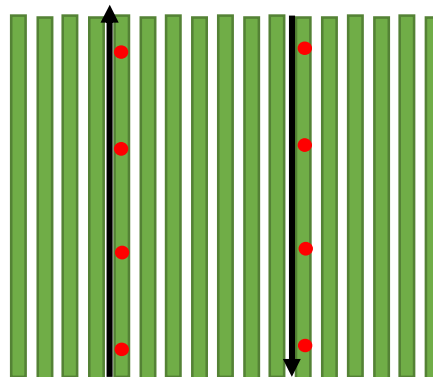
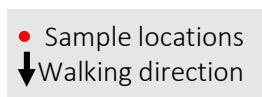
Raspberries/Blackberries

Monitoring period and frequency

- Once a week starting when 3 cm of lateral growth is present (early April) to September.

Full method

- Make **one to two passes** through each planting.
- A pass involves starting at the end of one row, sampling the first plant, then walking down the row, sampling plants at regular intervals until the end of the row.
- Take at least one to two samples per acre, with a **minimum of four samples per planting.**
- At each sample, inspect **five mature leaf triplets** for the eggs, mites, and webbing, using 10-15 X magnifying lens.
- Record the number of triplets with **Low (1-5), Medium (6-10), and High (>11) levels** using a printout of the data sheet template provided in this guide.
- Make a note if predators are found.



Strawberries

Monitoring period and frequency

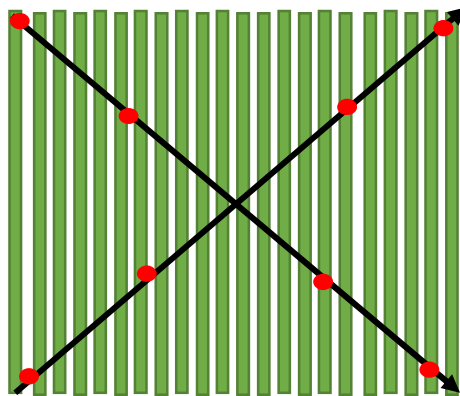
- Once a week from mid-April to September.

Full method

- Make **two diagonal passes** through each planting.
- A pass involves starting at a corner of the field and walking in a direct line towards the opposite corner, stopping along the way to obtain a minimum of **four samples per pass**.
- At each sample, pick off **five mature, fully-opened leaf triplets** and use a 10-15 X magnifying lens to inspect for eggs, mites, and webbing.
- Record the number of triplets with **Low (1-5), Medium (6-10), and High (>11) levels** using a printout of the data sheet template provided in this guide.
- Make a note if predators are found.



- Sample locations
- Walking direction



Quick method - *monitoring while doing other farm activities (all berries)*

- Look for the early signs of mite infestation: light specking on the upperside of leaves.
- Carry a 10-15 X magnifying lens to look for mites if damage is suspected.
- Mites can also be found by shaking symptomatic leaves onto a sheet of white paper.

When to Act

There is no specific action threshold. Tolerance for TSSM is dependent on multiple risk factors.

- **Pre-harvest:** act early to prevent onset of high pest levels.
- **Post-harvest:** tolerance for spider mites is higher in the post-harvest period because mites can no longer affect the current year's yield. Focus activities on noting hotspots and removing/destroying infested plant tissue, in preparation for the following season.

Risk factors to consider

- Have mite levels increased since last week?
 - More leaves infested? This indicates spread through the field. See Equation #1 below.
 - Larger colonies? This indicates population growth, increasing the potential for damage to plants. See Equation #2 below.
 - Are there eggs present with most colonies? Remember they could hatch in 3 days (under optimal conditions).
- Is the weather forecast favourable for mites?
 - Will the temperature be around 27 °C? This is optimal for mite development.
 - Is there rain in the forecast? Significant rain can slow mite development.
- Are there high levels of predators?
 - Remember that most predators are voracious eaters and relatively small numbers can limit the growth of TSSM populations.
 - If you consistently find predators across your samples, and mite levels aren't too high, consider waiting to apply controls.
- Is there a history of high mite pressure in the field?
 - TSSM tends to persist in hot spots and will overwinter in plant material and soil.
 - Fields with TSSM history will require more preventative, early management actions.

Calculations to help track mite levels over time:

1. Proportion of triplets infested with TSSM:

$$= \frac{\text{total \# of triplets with TSSM present}}{\text{total \# triplets checked}}$$

2. Average number of TSSM per triplet:

$$= \frac{\text{total \# of TSSM present}}{\text{total \# triplets checked}}$$

Note: You can choose one of the two calculations to track levels over time or use both. For Equation #2 use an estimate of 3 for a low, 8 for a medium, and 20 for a high triplet.

Example calculation:

In a raspberry planting with 4 sample points, we take 5 triplets at each point for a total of 20 triplets checked in the field. 6 triplets had TSSM present. Using our estimation method, we recorded 3 Low, 2 Medium, and 1 High.

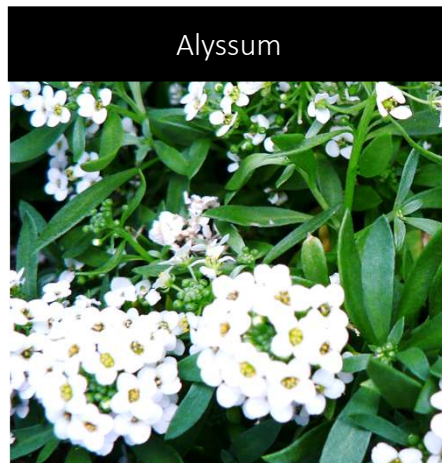
$$\text{Proportion of TSSM} = \frac{6}{4 \times 5} = 0.30 = 30\% \text{ triplets with TSSM}$$

$$\text{Average \# of TSSM per triplet} = \frac{(3 \times 3) + (2 \times 8) + (1 \times 20)}{4 \times 5} = 2.25 \text{ mites per triplet}$$

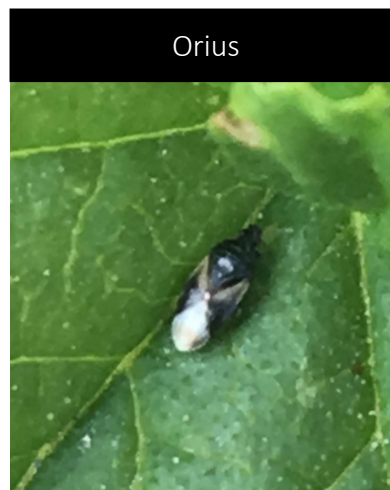
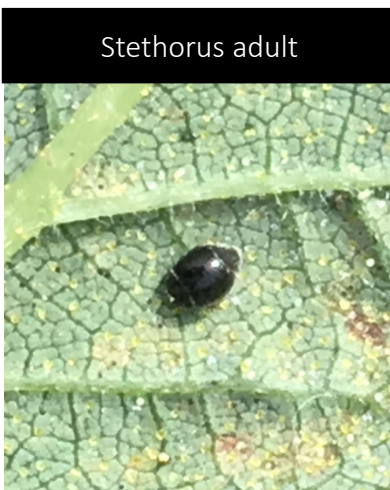
How to Manage

Biological control- *Natural predators*

- Help the establishment of predators. Plants such as alyssum attract predators and provide pollen and nectar which can help natural enemies establish earlier on the crop.
- Predators of mites include, but are not restricted to, lacewings, orius, predator mites, and ladybugs, including the spider mite destroyer ladybug (*Stethorus punctillum*).



Predator Identification



Biological control- *Predator release*

- Predator mites can also be purchased and released in berry plantings.
 - *Amblyseius californicus*, a predator mite, can be introduced at low spider mite density in dry conditions.
 - *Phytoseiulus persimilis*, another species of predator mite, can be introduced in hotspots as it is effective in high spider mite density.
 - Contact biocontrol suppliers for timing and rates. **If you have had TSSM issues in the past, consider a preventative release at the very early stage of infestation.**
 - Predator mites should be released on dry plant foliage, and not on the soil. Distribute evenly across the planting/infested area using a higher release rate in hot spots.

Predator mites can be purchased and released for TSSM management



Cultural and physical control

- Do not overfertilize.
- Frequently control/mow weeds and grassy areas around crop rows.
- Beware of workers' movement. TSSM can spread from infested crop to clean crop on clothes and tools.
 - Monitor and know where infestations are.
 - Plan farm activities so that movement from infested to clean fields is avoided.
- Remove heavily infested plant material if possible at the end of the season.
 - Mites will overwinter in plant debris and in the soil, which will increase spring populations the following year if left unchecked.
- Overhead irrigation can slow the population growth of TSSM.



Chemical control

- Consider spraying if populations are increasing, but before they cause significant damage.
- Complete coverage, including under the leaves, is necessary for sprays to be effective.
- Registered pesticides used in **organic production** for control of TSSM include the active ingredients mineral oil and potassium salts of fatty acids (insecticidal soap) for suppression only. Always check with your organic certification body before using any pesticide products.
- Please refer to the **BC Berry Production Guide** for current organic and conventional spray options for TSSM in berry crops.
- Both organic and conventional spray options may have negative impact on predators. Consult Biobest Side Effect Manual below for toxicity information.
- Always read the label prior to applying any pesticide products.



References and Links:

BC Production Guide – Berries

<https://www2.gov.bc.ca/gov/content/industry/agriservice-bc/production-guides/berries>

Pacific Northwest Plant Disease Management Handbook – Two-spotted spider mite

<https://pnwhandbooks.org/insect/small-fruit/strawberry/strawberry-twospotted-spider-mite>

<https://pnwhandbooks.org/insect/small-fruit/cane-fruit/cane-fruit-spider-mite>



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Two-Spotted Spider Mite in Berry Crops Data Sheet Template

Date	Planting ID	Sample #	# triplets with Low TSSM	# triplets with Medium TSSM	# triplets with High TSSM	Percentage of triplets with TSSM	Average # of TSSM per triplet	Predators/Comment
		1						
		2						
		3						
		4						
		1						
		2						
		3						
		4						
		1						
		2						
		3						
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		1						
		2						
		3						
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Low= 1-5 TSSM , Medium= 6-10 TSSM, and High >11 TSSM

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