

SPRUCE SPIDER MITE

Oligonychus ununguis
(Jacobi)



Spruce spider mite feeding damage. *Courtesy of Eric R. Day, Virginia Tech, Bugwood.org (#0717020)*

Hosts

- All conifers, especially spruce and Fraser, Canaan, and balsam firs

Damage Potential

- High

Symptoms and Signs

- Small, irregularly shaped yellow spots (“stippling”) on needles; on fir, needle base may be pale
- Rusty or bronzed needles; damage may appear most severe during hot, dry weather
- Premature needle drop
- Damage heaviest at the bottom inside of the tree; damaged needles will not recover from the chlorophyll lost as a result of mite feeding
- Fine webbing on needles and twigs; cast skins, dead mites, dirt, and other debris trapped in the silk
- Infestations frequently occur in pockets, not distributed evenly through field

Causes of Similar Symptoms

- Rust mites (spruce and fir)
- Rhizosphaera needle cast (spruce)
- Air pollution
- Aphids (spruce)

Identification

A 15–20X hand lens or small microscope is required to view spider mites and eggs. Adult spruce spider mites are oval and only 1/50 inch (0.5 mm) long. They have thin hairs, or setae, on the top of their convex bodies. The body color depends on the host and varies from pale green to dark green or dark red; legs are generally pale in color. The first stage, a six-legged larva, is salmon colored until it has fed for a short time. After feeding, the larva and all subsequent stages are generally green or dark red. The eggs are rounded and vary from tan (active season eggs) to red (overwintering eggs).

Each egg has a single hairlike stripe on the top, which can be used to distinguish spruce spider mite eggs from other spider mite eggs that may be found on conifers.

Two other spider mites occur on Christmas trees: two-spotted spider mite and admes spider mite. The two-spotted spider mite is generally green with two dark spots, one on either side of the oval body. It is slightly smaller than spruce spider mite and overwinters as an orange female. The admes spider mite has only been found on spruce and is larger than spruce spider mite. The body is more flattened and reddish brown with long, pale legs. The admes mite overwinters as an egg.

Biology and Life Cycle

Spruce spider mites can develop from an egg to an adult in 2–3 weeks under normal conditions (Figs. 1 and 2). It is a cool-season mite and attains the highest populations in spring and fall; temperatures above 80–90°F will result in population decline. During the hot, dry weather in summer, spruce spider mites seem to disappear, only to reappear when temperatures moderate in late summer or fall. Spider mites are still present during summer, but feeding and reproduction are greatly reduced. Predatory mites are very common on the host plants at this time of year.

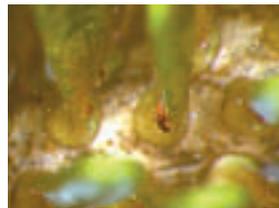


Figure 1. Adult spruce spider mite. *Courtesy of Rayanne D. Lehman, PDA*



Figure 2. Adult spruce spider mite. *Courtesy of Rayanne D. Lehman, PDA*

Calendar of Activities

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Symptoms	[Solid black bar]											
Monitor			[Green bar]									
Mechanical Control												
Spray Control			[Green bar]									

[Green bar] Monitor for egg hatch.

[Light green bar] Apply dormant oil.



Figure 3. Overwintering spruce spider mite eggs. *Courtesy of Sandy Gardosik, PDA*



Figure 4. Newly molted spruce spider mite adults. *Courtesy of Sandy Gardosik, PDA*



Figure 5. Chlorotic spots resulting from spider mite feeding. *Courtesy of PDA*



Figure 6. Spider mite feeding damage on older growth. *Courtesy of USDA Forest Service Northeastern Area Archive, Bugwood.org (#1396124)*

Spruce spider mites follow the typical spider mite life cycle: egg, six-legged larva, two eight-legged nymphal stages, and adult (male or female) (Figs. 3 and 4). Between each of the active stages, a resting stage, or chrysalis, is formed as the mite prepares to shed its outer skin. This molting stage is generally not affected by chemical controls. The male completes development first and may be seen “guarding” the female chrysalis until she emerges and mating occurs. Mated females produce both male and female offspring, while unmated females produce only females. Depending on temperature, each female can deposit an average of 30–40 eggs during her lifetime. After the first generation, overlap of generations is common and all stages are present at any given time.

Spider mites have piercing-sucking mouthparts. As they feed, they withdraw sap containing chlorophyll from the needles (Fig. 5). They prefer to feed on older growth and will generally not feed on current-year needles until they have hardened off (Fig. 6). This species generally does not produce copious amounts of silk. But, when populations are high, larvae can spin down on the silk threads they produce and be carried by air currents, insects, birds, or other animals to new host plants (Fig. 7). Six or more generations occur a year in Pennsylvania.

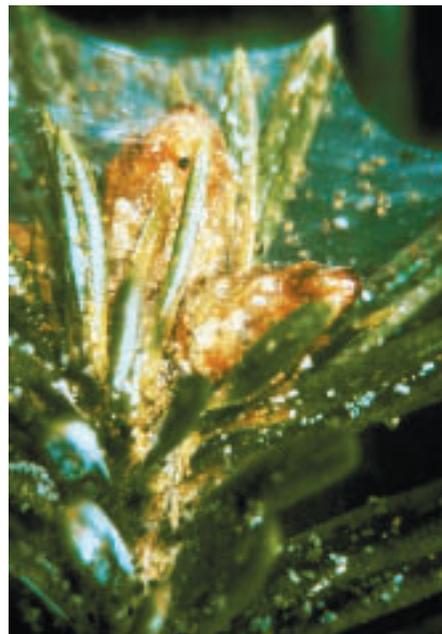


Figure 7. Spider mite webbing buildup during a more severe infestation. *Courtesy of USDA Forest Service Region 4 Archive, Bugwood.org (#0949037)*

Monitoring and Management Strategies

Plantation Establishment

- During site selection, consider elevation and aspect of the field. Warmer temperatures generally associated with south-facing slopes and lower elevations favor spruce spider mite populations.
- Drought-prone locations favor population buildup.
- Inspect nursery stock for infestations.

Preseason

- Manage groundcover and surrounding area to encourage natural predators.
- Growing degree days: Based on observations in Pennsylvania, egg hatch occurs at 50–121 GDDs.
- Scout trees for overwintering eggs in very early spring with a 15X hand lens. Examine shoots for red, rounded eggs usually located on twigs at the base of needles or around buds. Monitor for egg hatch by tagging one or more trees known to have a population of overwintering eggs. Hatch will generally begin on the south side of the tree. Make observations every few days to determine when eggs begin to hatch. Egg hatch occurs prior to bud break. Record percentage of egg hatch if miticide use is planned.
- Scout for active forms by holding a light-colored surface (paper, paper plate, painted clipboard, inside back cover of this manual, etc.) beneath a branch. Tap the branch sharply by hand or with a stick (Fig. 8). Mites will be dislodged and drop to the monitoring surface. Tilt the surface slightly to allow dirt and debris to slide off and then observe for mites. Spider mites will begin to crawl and appear as minute dark dots moving slowly over the surface. Examine with your hand lens to verify that they are spider mites. Sample several branches around the tree and multiple trees per block to determine population level.
- Smearing suspected mites can be another test—dark green or dark red smears on the monitoring surface usually indicate spruce spider mites.
- Populations can be estimated by examining shoots of current growth taken from the bottom third of trees. Use a hand lens to check for active forms or viable eggs. Sample about 15 shoots per acre or a minimum of 10 shoots in a small block; sample every part of block as populations tend to

be spotty in a field. Determine the percentage of shoots that have mites or mite eggs. Repeat this procedure every several weeks to detect population fluctuations.

- Emerald green arborvitae is a good indicator plant and will show signs of infestation early. If planted, monitor closely for first signs of spruce spider mites.

Growing Season

- Continue monitoring populations using the beating method or by observing eggs or active mites on branches. Repeat sampling every 3–4 weeks throughout the growing season and within one week following pesticide application.
- Watch for increase in population numbers, which may require control. Damage observations, although helpful in locating populations, are not accurate measures of population levels.
- Drought and/or warm weather around autumn could delay fall egg hatch.
- Growing degree days: Peak mite activity occurs at 192–363 and 2,375–2,806 GDDs.
- Threshold level—two methods described below determine the economic threshold:
 - Mites per branch: More than 10 mites per branch on most branches sampled indicate that pesticide intervention is recommended.
 - Percentage of infested trees: Divide the number of shoots with mites and/or mite eggs by the total number of shoots examined and multiply by 100 to calculate the percentage. Refer to the table below to determine if pesticide intervention is recommended.

THRESHOLD LEVEL

Size of Tree	Economic Threshold*
Less than waist high (< 3.2 feet)	Up to 40%
Waist high (3.2 feet), year before sale	Up to 20%
Greater than waist high (> 3.2 feet), year of sale	Up to 10%

*Threshold levels may be different for trees that will be dug as opposed to cut. Check with your state/regional plant inspector for acceptable mite levels.

- At the end of the season, update records and evaluate results.

Control Options

Biological

- While scouting for spruce spider mites, also look for natural predators such as fast-moving, pale phytoseiid mites, hover fly larvae, lacewing larvae, dusty wings, and lady beetles. All are effective predators and may help control the population of spruce spider mites. Refer to Appendix B: Biological Controls Photo Chart for pictures.

Mechanical

- Streams of water under pressure can effectively wash mites from trees. However, this is not practical in the field situation, but long periods of heavy rain can significantly reduce mite populations.

Biorational

- Dormant oil applied prior to egg hatch can reduce the population. Note: Oil will remove the blue coloring from spruce.

Chemical

- General insecticides are not as effective for control as are specific chemicals referred to as miticides. General insecticides are often detrimental to populations of beneficial insects and mites.
- Numerous miticides are available for controlling spruce spider mite on Christmas trees. Ovicides that target eggs and materials that control both eggs and active forms often provide the longest control. Ovicides generally do not work on overwintering eggs. For best results, apply controls when population is low or starting to build. Evaluate control after 5 days.
- A second application may be needed in 7–10 days, unless prohibited on the label. Some labels recommend application one time per year or even every other year to lessen chance of resistance developing in the population.
- Spider mites are capable of quickly becoming resistant to a particular miticide due to their rapid reproduction. To avoid resistance, alternate classes of chemicals every third application.

Next Crop/Prevention

- Purchase and plant pest-free nursery stock from a reputable company.



Figure 8. Tapping branches over white paper to dislodge mites. Courtesy of Brian Schildt, PDA

