50. Mites

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Hosts

The spider mites are the primary mite pests in forest nurseries. A second group, the rust and gall mites, can cause significant damage.

Spider mites (family Tetranychidae) in the genus *Oligonychus* are often pests on conifers. The most important species in this group is the spruce spider mite, *Oligonychus ununguis*, which attacks spruce, hemlock, fir, juniper, larch, redwood, incense cedar, and pine species. *O. milleri* can cause damage to nursery seedlings. *O. subnudus* and *O. coniferarum* infest conifers and are common in the Western States. *O. ilicis* is found on conifers in the Southern States. Some *Oligonychus* attack deciduous trees. *O. bicolor* is found on oaks and *O. platani* on sycamores and related species. Spider mite species in the genus *Eotetranychus* attack a variety of hardwoods.

The rust and gall mites (superfamily Eriophyoidea) cause two kinds of damage. Rust mites feed on the leaf surface and cause discoloration; gall mites cause the host plant to make distinctive growths on leaves and buds. The mites live in these galls. Rust mites in the genus *Trisetacus* are the eriophyoids most likely to be encountered in nurseries. Numerous species infest pine, spruce, cedar, Douglas-fir, cypress, and juniper.

Distribution

Spider mites and rust and gall mites are widespread. They can be found across the range of their hosts. Some mite species are host-specific.

Damage

Reduced tree growth and vigor are the major effects of severe mite infestations. Seedlings and small trees may be weakened and made susceptible to other problems. Trees are seldom killed by mites; however, seedling mortality may occur. Feeding damage makes trees unsightly.

Spider mites use their needle-like mouthparts (fig. 50.1) to pierce plant cells and suck out the cell contents, resulting in yellowing or browning of needles and leaves (fig. 50.2). Feeding by the spruce spider mite results in a mottled needle appearance; yellow spots appear on needles as the mites feed. The needles eventually turn yellow or brown. Associated with the discolored needles is a dense webbing made by the mites (fig. 50.3).

Figure 50.1—*Magnified (200x) image of a spider mite,* Tetranychus platani, *showing the mouthparts. The mite uses the long, paired, recurved stylets to pierce the plant cell and extract the cell contents.* Photo by Alex C. Mangini, USDA Forest Service.

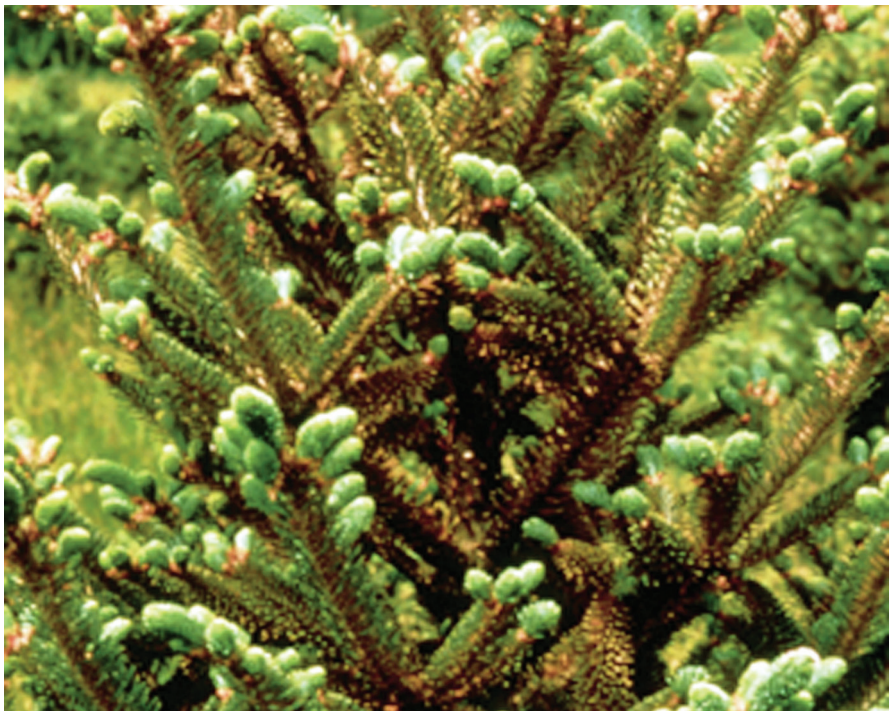

Figure 50.2—*Browned needles resulting from an infestation of the spruce spider mite,* Oligonychus ununguis, *a serious pest in conifer nurseries and plantations.* Photo from USDA Forest Service—Northeastern Area Archives, at http://www.bugwood.org.

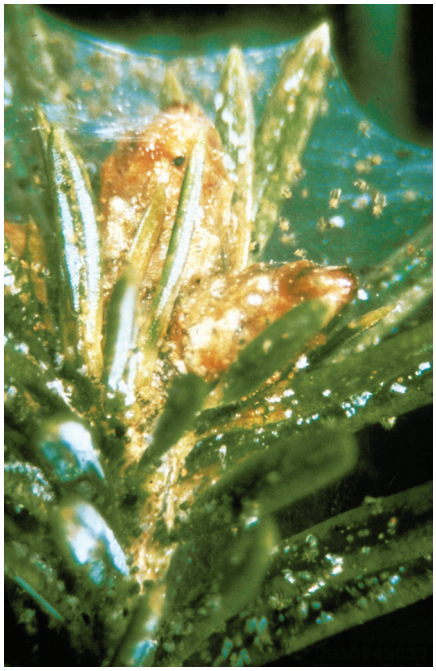

Figure 50.3—*Spruce spider mites and the webbing they produce are visible in this branch tip from an infested conifer.* Photo from USDA Forest Service—Region 4 Archive, at http://www.bugwood.org.

Figure 50.4—*Infestation of a white pine needle sheath by rust mites* (Trisetacus). *The top needle shows feeding damage. Mites are visible in the center right.* Photo by Alex C. Mangini, USDA Forest Service.

Rust mites cause similar damage to that caused by the spruce spider mite. *Trisetacus* species on conifers discolor needles (fig. 50.4). When infestations are severe, the needles yellow and eventually turn a reddish-brown or rusty color (hence the name rust mites). Feeding by gall-making eriophyoid mites causes the host to form distinctive, sometimes bizarre shaped galls (fig. 50.5). These gall-formers are common on deciduous hardwood hosts. As with the spider mites, the eriophyoids have piercing mouthparts that enable them to penetrate the plant cells.

Figure 50.5—*Spindle-shaped leaf galls caused by gall mites on a* Prunus *leaf. The mites live and feed within the galls.* Photo by Steven Katovich, USDA Forest Service, at http://www.bugwood.org.

Diagnosis

Spider mite presence is indicated by leaves or needles that are pale, washed-out, and discolored—yellow or brown needles are common (fig. 50.6). Heavy infestations during hot, dry summers can cause defoliation. Most, but not all, spider mite species form a fine webbing on needles and leaves. For example, spruce spider mites produce webbing that can form a dense covering over needles. Mites can be seen by shaking an infested branch over a white paper sheet. The mites fall onto the paper and appear as tiny red, yellow, or green specks on the paper. A careful look using a hand lens will show the mites walking on the paper. The mites have globular bodies (fig. 50.7) with four pairs of legs (three pairs in the larval stage). The eggs may be spherical or spherical with a stipe—a thin extension at the top. For example, spruce spider mite eggs are green when laid and turn reddish brown (fig. 50.7).

Eriophyoid rust mite infestations are indicated by leaves that yellow and eventually turn brown or rusty. Rust mites are extremely small—0.1 to 0.5 mm long—and must be seen using a hand lens or microscope. They are elongated and worm-like with four legs at the head end of the body. They are yellowish-white in color and are slow moving (fig. 50.8).

Rust mite damage on conifers is similar to that caused by spider mites. To distinguish the damage, shake an infested limb over a white paper sheet. Spider mites will be visible on the paper as dark specks. Rust mites, however, are far too small to be seen on the paper without a hand lens. The presence of webbing will also distinguish the spruce spider mite from rust mites. Trees with bronzing should be examined by removing the needle sheath and using a hand lens to examine the exposed needle bases.

Biology

Spider mites have five life stages—egg, larva, protonymph, deutonymph, and adult. The larva has three pairs of legs; the nymph and adult stages have four. Spider mites have very short life cycles and populations can grow rapidly. The spruce spider mite overwinters as eggs at the needle base. The eggs hatch in spring and reach the adult stage in about 15 days. Several generations occur in a season. One female spider mite can lay up to 50 eggs. Most eggs develop into females. As a result, populations expand rapidly when conditions are good. The mites and their eggs are protected by the dense webbing they produce. The mites disperse by wind; because of their small size, they are easily lifted into the air on wind currents.

Rust mites in the genus *Trisetacus* overwinter as adults and eggs in the needle sheaths of their conifer hosts. In the spring, they move to new growth. Several

Figure 50.6—*Ponderosa pine seedlings damaged by* Oligonychus subnudus *show the characteristic pale, yellow appearance resulting from extensive spider mite feeding.* Photo by Whitney Cranshaw, Colorado State University, at http://www.bugwood.org.

Figure 50.7—*An adult female of the spruce spider mite,* Oligonychus ununguis. *The body is dark while the legs and mouthparts are lighter in color. Below the female is an egg with the characteristic thin stipe at the top of the egg.* Photo from USDA Forest Service—Northeastern Area Archives, at http://www.bugwood.org.

overlapping generations occur per year. When populations become very large, the mites will leave the needle sheaths and feed on the exposed needle surface. These mites are usually present on their conifer hosts at all times. Population outbreaks occur when weather conditions are favorable. Also, repeated insecticide application promotes outbreaks by eliminating natural enemies.

Control

Biological

Both spider mites and rust mites have natural enemies that keep their populations in check. Several arthropod natural enemies feed on spider mites. These enemies include beetles in the family Coccinellidae, anthocorid bugs, predaceous thrips, and predaceous mites in the family Phytoseiidae. By far the most important biological control agents are the phytoseiid mites.

Figure 50.8—*An adult* Trisetacus *rust mite feeding on a white pine needle. Note the elongated body and the two pairs of legs. The mouthparts are between the first pair of legs.* Photo by Alex C. Mangini, USDA Forest Service.

Phytoseiid mites are common associates of spider mites and have been much studied. About 2,000 species exist worldwide. Most species are predatory but also feed on pollen, honeydew, and rust mites. Many are specialist spider mite predators (fig. 50.9); these include species in the genera *Phytoseiulus*, *Galendromus,* and *Neoseiulus*. Phytoseiids have a short life cycle, produce many eggs per female, and have a preponderance of females in the population. Under ideal conditions, a 5-day generation time is common; one female can lay up to five eggs per day for several weeks. This rapid population growth makes them useful control agents against spider mites. Phytoseiid mites are available commercially for use in greenhouses and nurseries.

Cultural

Mite infestations can build up quickly. During the growing season, trees should be monitored for mite presence. If found, mites and eggs can be washed off with a strong water spray. Proper irrigation to maintain growth will reduce the impact of mites. Avoid planting host species such as pine, cedar, hemlock, fir, juniper, or spruce adjacent to windbreaks of the same species.

Figure 50.9—*A pale yellow phytoseiid mite,* Galendromus occidentalis*, feeding on a European red mite,* Panonychus ulmi. *Phytoseiids are important biological control agents against spider mites.* Photo by Elizabeth H. Beers, Washington State University.

Chemical

Spider mites and rust mites may occur in nurseries after insecticide application that controls other pests. The natural mite enemies are killed and conventional insecticides may not affect mites. It may be necessary to apply miticides in severe infestations. Modern miticides are the avermectins, organotins, and the benzoylureas. The latter interrupt growth by inhibiting transition from one stage to the next. Products should be alternated to avoid pesticide resistance in mites. When applying miticides, it is important to ensure thorough coverage of the plants.

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