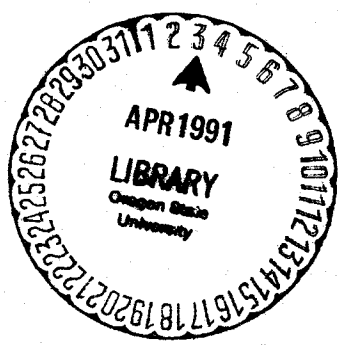


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Spruce Spider Mite Biology and Control in Christmas Trees



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SPRUCE SPIDER MITE BIOLOGY AND CONTROL IN CHRISTMAS TREES

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The spruce spider mite, *Oligonychus ununguis*, is a serious pest of conifers grown for Christmas trees. Large numbers of this mite cause yellowing and bronzing of the foliage of infested trees and possibly premature needle drop. Serious damage close to harvest may result in unmarketable or less valuable trees. Some trees may even be killed.

We believe that the spruce spider mite is normally under natural control by predator mites called phytoseiids. We have found two species of predator mites that are important in Christmas tree plantations. Management practices or environmental conditions can disrupt the natural balance between spider mite and predator allowing rapid mite buildup and damage. Use of insecticides and miticides that kill predatory mites as well as the pest mites may cause later outbreaks of the pest mites.

Damage. Spruce spider mite feeding kills the green cells in needles resulting in a "stippling" of the foliage. Stippling is confined to the base of needles when populations are low but will occur over the entire needle surface when mite numbers are high. Stippled needles first appear yellow and later turn reddish brown. Mite damage is normally seen first at the bottom of trees in the lower whorls of branches and becomes noticeable higher up in the crown as mites become more numerous. Heavily infested trees appear to have yellow stripes down the middle of their branches.

Description. The adult spruce spider mite is dark green to black with eight orange legs. They are quite small (about 1/50th of an inch) and are best seen with a hand lens. Immature mites resemble adults but are smaller and tend to be reddish-orange and green. The eggs are slightly flattened, round and orange to red in color. Eggs are most often found in the axils of needles along the stem.

Life cycle. The life cycle of the spruce spider mite is shown in fig 1. Most spider mites spend the winter months as adults in protected areas. The spruce spider mite, however, spends the winter in the egg stage. Egg hatch in the spring is regulated by day length and air temperature. Eggs usually begin to hatch in early April before bud break, in western Oregon, and immature mites feed on needles from the previous year. Mites move to newly expanding needles as they become available.

Cool weather slows mite development during early spring. Adults may not be present until the end of April. Adult females lay eggs starting a cycle that continues throughout the summer. Unusually warm and dry weather during spring can accelerate mite development and lead to sudden increases in mite populations.

Monitoring. Spruce spider mites are difficult to see without a large diameter 10x or 15x hand lens. Virtually every Christmas tree plantation has some spruce spider mites present. Stippling at the base of needles on the lower whorl of branches in Douglas-fir is common even when mites are not a problem. Look for damage

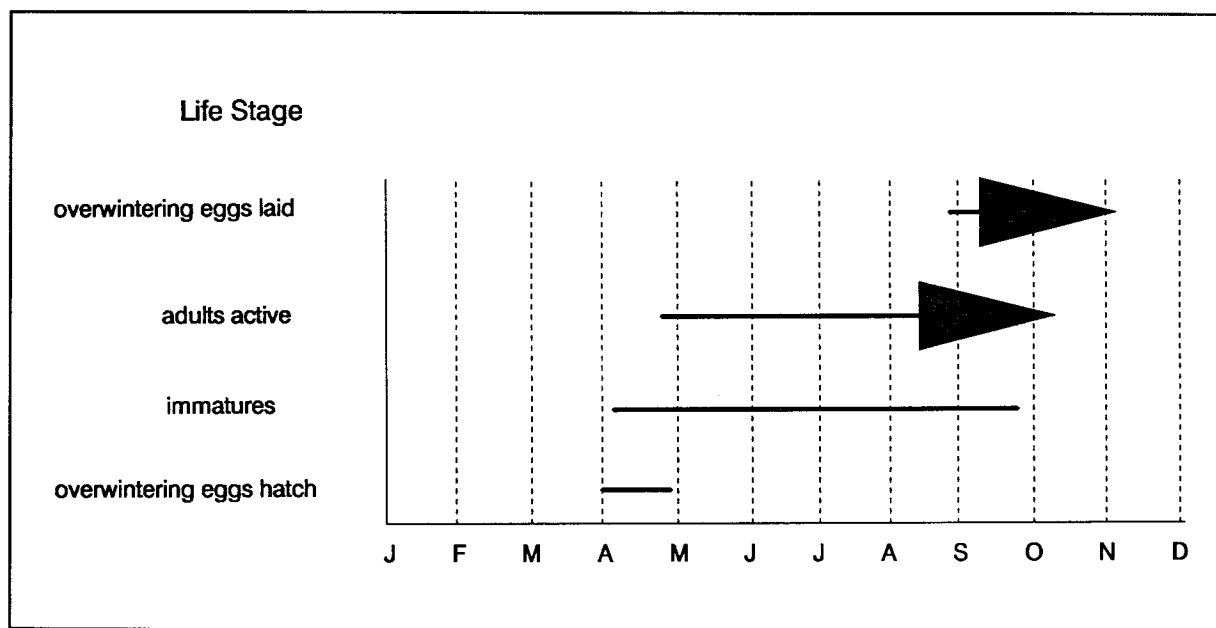


Figure 1. Life cycle of the spruce spider mite in the Pacific Northwest

about halfway up the canopy and in the interior part of the tree. If stippling is present, look for the mites. Look for mites and eggs on the tips of branches in the upper part of noble fir trees. Before April 1st look for overwintering eggs. Examine 15 - 30 trees in various locations throughout the field. Pay particular attention to trees along roads where dust may accumulate.

At present, there is no threshold level for treatment for spruce spider mite that we can use to determine whether or not a chemical application is necessary. Such a threshold will ultimately be based on both the numbers of mites and their predators. Until then, a decision to spray for spruce spider mite should be based on the previous year's damage level and the number of overwintering eggs found in early spring. When mite populations are dangerously high, eggs may be placed in large numbers on the upper side of the needles along the mid vein. Chemical control is necessary in this situation.

Control. Sooner or later chemical control of spruce spider mites will probably be necessary, particularly in the years just before harvest. A decision to control should be based on monitoring as described above. If large numbers of overwintering eggs are found in February or March, consider a ground application of horticultural oil (superior, supreme oil) prior to egg hatch (April 1). Oils, applied from the ground, have been shown to be effective in smothering mite eggs. Use of acaricides other than oils during early spring is not a good idea because air temperatures are too low, and heavy rain during the month of April is one of the best natural controls of the spruce spider mite. The rain knocks mites off the foliage and they are unable to return to the trees.

The typical pattern of spruce spider mite population development is shown in fig. 2. Unless there are long periods of warm, dry weather or a noticeable

accumulation of damage on the foliage, it is better to wait until May or early June before applying chemicals other than oil.

Factors that affect mite outbreaks include weather (temperature and

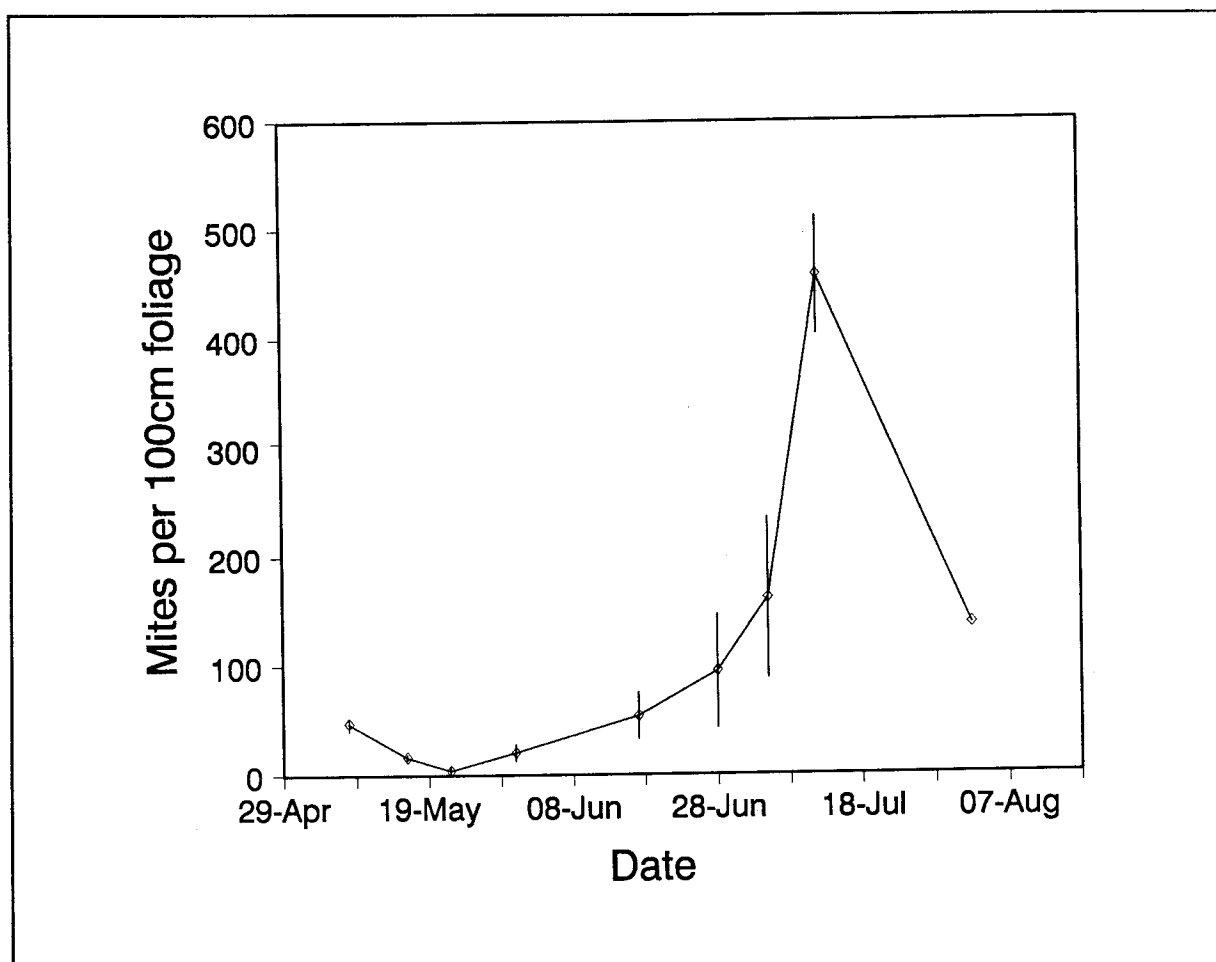


Figure 2. Typical pattern of spruce spider mite population levels during spring and summer in the Pacific Northwest.

precipitation), dust from roads, and use of chemicals. Dust may promote mite outbreaks by providing protected sites for egg laying and by interfering with the movement of predatory mites. Periods of unusually warm, dry weather during early spring may cause mites to increase as well.

Some pesticides may cause outbreaks by increasing spider mite reproduction or by killing or repelling predator mites. Applications of carbaryl (Sevin), dicofol (Kelthane), and synthetic pyrethroids (Asana and others) have been associated with subsequent spider mite outbreaks. Care should therefore be taken when selecting chemicals for use in your plantation. Improper selection may result in the need for a second or sometimes even a third application the same year.

Once predator mites are eliminated from a field (by improper acaricide use or some other factor) they return very slowly. It may take several seasons before a sufficient number return to restore effective natural control.

MITICIDES AVAILABLE FOR SPRUCE SPIDER MITE CONTROL IN CHRISTMAS TREES

CHEMICAL	COMMENTS	IMPACT ON PREDATOR
horticultural oils	use ground application in spring to control eggs; may be phytotoxic if used in warmer months	very gentle on predator populations if used according to label
insecticidal soaps	little work done in Christmas trees but has been effective in other crops	gentle on predators if not used too often
Kelthane MF	rapid, effective kill; recommended use only as a rescue treatment for trees to be harvested soon	persistent and very detrimental to predator mites; not compatible with IPM approach
Omite CR	effective and long-lasting control, slow action at low temperatures	gentle on predator mites when used according to label; compatible with IPM
Pentac Aquaflow	very little use in Christmas trees but has proven to be a good miticide in the greenhouse	unknown
Talstar 10 WP	relatively new synthetic pyrethroid; broad ornamental label; efficacy in Christmas trees unknown	unknown but other synthetic pyrethroids have proven to be extremely persistent and repellent to predator mites
Vendex 4 L (24c label in OR & WA)	effective long-lasting control; slow acting; a single early season application may give season-long control	gentle on predator mites; compatible with IPM

Pesticide resistance. Pesticide resistance develops when the same chemical is used at too high a rate or too often. Unnecessary or "extra" applications of chemicals, or applications at higher than label rates, may result in resistant mites. As far as we know, resistance is not yet a problem in Christmas trees in the Pacific Northwest, but spider mites have developed resistance in many other cropping systems. Therefore, where more than one acaricide application per season is necessary, consider rotating chemicals. Vendex 4L should never be applied more than once per season to delay the onset of resistance. We recommend the use of Kelthane MF only late-season on fields that will be harvested that year (because of the danger of subsequent spider mite flare-ups). Vendex 4L, Omite CR, and Pentac Aquaflow are slow-acting, so it may take several days to 2 weeks before mite activity stops, particularly if air temperature is low.

Spray application. Good spray coverage is essential for effective spruce spider mite control regardless of which acaricide you use. Where possible use air-blast ground equipment or spot treat with a backpack sprayer. If application by air is necessary the best coverage can be achieved as follows: apply one-half the rate and gallonage in one direction and then finish by applying the other half at right angles to the first application. Follow the label specifications for the spray volume. Air temperature above 75°F are likely to enhance the efficacy of the application.

Because of constantly changing labels, laws, and regulations, Oregon State University and Washington State University can assume no liability for the consequences of the use of any chemicals suggested here. ***Always read and follow the specific product label directions carefully when using any pesticide.*** Mention of any trade name or specific formulation in this bulletin implies no endorsement by Oregon State University, Washington State University, the authors, or the States of Oregon and Washington.



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