



# Christmas Tree Notes

## Balsam Twig Aphid on Fraser Fir

CTN-019

The balsam twig aphid (BTA) (*Mindarus abietinus*) is a small, pale green aphid that feeds on fir trees in the spring. Their feeding on Christmas trees in western North Carolina often results in permanently curled needles which reduce the tree grade, quality, and value. Trees badly damaged may have to remain in the field an additional year or more so that good undamaged growth will cover up the damaged needles. Further damage is often created by the appearance of sooty mold, a black fungus that lives on the honeydew excreted by aphids and other pests. The black on the tree trunk and stems can stay on the tree until winter, further affecting the tree's appearance.

Since the BTA is native to western North Carolina, it is widespread and well adapted to the area. It can attack any species of true firs. Therefore the year of sale and year before sale, all Christmas tree growers must evaluate their trees to determine if they need to control this pest.

### Balsam Twig Aphid Lifecycle

The BTA has an unusual lifecycle, different from any of the other pests of Fraser fir. There are three distinct adult forms that are produced one after another. Each has a role in the lifecycle and each must be produced in succession for the lifecycle to be complete. Each adult form is preceded by the smaller immatures which grow and molt to the adult. The first form, the stem mother, increases aphid numbers. The second form is winged and allows the aphid to spread to other areas. The final form produces the overwintering egg.

**The Egg.** The aphid both "oversummers" and overwinters as a small, black, tear-dropped shaped egg with white waxy rods covering it. Eggs can be found anywhere on the tree, but are most common on the newest shoots. These eggs begin to hatch in the spring from early March through mid to late April.

**The Stem Mother.** The aphids that hatch from the eggs are all female. Each aphid molts three times, becoming a little larger with each successive molt. These stem mothers produce live aphids which are all clones, genetically identical to the mother. Each stem mother can produce as many as 70 live young. This allows a quick buildup of the population. Usually this occurs just prior to or just as the buds start to open. The adult stem mother and her offspring are easy to find, often feeding on the buds as they start to break.

**The Winged Form.** The young aphids that the stem mother produces also go through three molts. At maturity some of them will be like the stem mother, allowing a further build-up of the population. However, at some point the stem mother's offspring will be different, having wings at maturity. These are also all female and also lay live young.

Though this stage has wings, they are not as useful to the aphid as the wings of a fly or bee. They are only strong enough to lift the aphid away from the tree for the wind to blow it to another location. The winged stage is found in May and June in western North Carolina.

**Completing the Life Cycle.** The young that the winged form produces also go through three molts to become an adult. These adults are either male or female. This is the only time males are produced in the lifecycle any given year. Following mating, the females lay one or two overwintering eggs. Eggs are first found at the end of May and June in western North Carolina. All twig aphids have died off by early July.

**Aphids in the Greenhouse.** In rare cases, twig aphids have been found on Fraser fir seedlings in greenhouses which have continued to feed and reproduce late into the summer. Seedling growers should scout seedlings periodically for presence of the aphids.

## Twig Aphid Dynamics

While the BTA is completing its lifecycle, the tree is breaking bud. How badly the tree is damaged depends on how many aphids are feeding on it when the shoots are expanding. The overwintering egg population is the starting point. If there are lots of eggs, it is almost guaranteed that there will be enough aphids to cause a problem. However, even a few eggs can develop into a large population by bud break if the weather is right. The warmer it is, the faster each individual will molt and reach maturity. Cold weather slows down the process. It will also slow bud break. Freezing temperatures kill many individuals. Rain washes aphids from the trees and allows a fungal parasite to grow, killing many aphids. Rain can also hasten bud break.

**The Effect of Predators.** Added to this dynamic process are natural predators. The balsam twig aphids are food for many predators, the primary ones being several species of hover fly larvae, lady beetles and their larvae. Other predators also feed on twig aphids including lacewings, aphid midges, nabids, and big-eyed bugs. Predators can sometimes give control by eating the majority of twig aphids on a tree. However, their numbers usually lag behind the twig aphid build-up. Their influx is also slowed by cold, wet weather. Unfortunately, it's usually the case that tree damage has occurred by the time the predators control the aphids.

**The Effect of the Tree.** The tree itself will also help determine how much damage will occur. Trees break bud over several weeks. Usually, it is the trees that break bud first that end up having the most twig aphid damage. However, that isn't always the case. In some years where cold, wet weather slows the twig aphid development, it is the late breaking trees that get the most damage because twig aphid numbers developed later in the season. Also, if there is plenty of rainfall in the spring and the trees are adequately fertilized, much of the needle curl seen in mid-May will straighten out by the time the needles are mature in early July.

**Cones Are a Factor.** A third factor that affects twig aphid damage is cone production in trees. Fraser fir doesn't readily produce cones in western North Carolina until the trees are larger than what is cut for Christmas trees. However, if the weather was dry the year before and the trees were under drought stress, trees even as small as 4-feet will produce cones. The cone buds break and elongate before the shoots do. This provides a place for twig aphids to hide and feed where they are also protected from pesticide application.

## Assessing the Need for Treatment

So how does a grower know if there are enough aphids to cause a problem? One option is to not worry about it and treat based on the year in the rotation. Trees need to go to market with at least two years of undamaged needles. Therefore, the BTA needs to be controlled the year of sale and year before sale. Many growers treat for BTA control these years in the rotation in the spring regardless of the weather and pest numbers.

For the most part, twig aphid control in younger trees is unwarranted. Heavy twig aphid damage will reduce tree growth. But, the trees will produce plenty of buds for the following year, much the same way as they do when frost damage occurs. The trees seldom lose growth in the course of the rotation unless suffering from drought stress.

The other option is to scout in the spring to determine if treatment is necessary. Many years, twig aphids do not cause damage even if left untreated, either because their numbers are so low, or because weather conditions favor the rapid expansion of the new growth and straightening of the curled needles.

Twig aphid scouting is not easy because twig aphid numbers can expand so quickly at bud break. Multiple scouting trips may be necessary from mid April to early May. And even then, the decision to treat may need to be made even as the trees are breaking bud. This greatly reduces the options for control. But scouting can aid in accurately identifying fields that do not need treatment. This is often the case depending on prior pesticide use in the field.

**Twig Aphids and Past Pesticide Use.** Trees that have been treated with an insecticide in June (for the control of rosette bud mites) or fall (for the control of balsam woolly adelgid and/or *Cinara* aphids) may not need to be treated as the twig aphids may have already been controlled. However, these trees will need to be scouted to make sure controls have worked well enough not to result in damage.

**Rosette Bud Mite Control and Twig Aphids.** Rosette bud mites are controlled by applying pesticides in June. This is the time when the twig aphid is producing eggs for the following growing season. Pesticides applied during this timeframe will eliminate any twig aphid eggs for the following year. However, scouting is still required in the spring to make sure no aphids are left.

**Fall Insecticide Use and Twig Aphids.** Materials applied to control the balsam woolly adelgid or *Cinara* aphids from August through November can also result in twig aphid control the following spring, though the mechanism of control is not well understood. The synthetic pyrethroids such as Talstar (bifenthrin), Astro (permethrin) and Asana (esfenvalerate) appear to be best at controlling twig aphids when applied in the fall though other materials also have provided some control. Again, it is important to scout in the spring to determine if controls are adequate, especially if materials applied in the fall were put out with a mistblower which gives poorer coverage than a high-pressure sprayer.

**Balsam Woolly Adelgid Control and Twig Aphids.** Balsam woolly adelgid controls made as early as January and February will also frequently result in twig aphid control later that spring. However, the use of Thionex (endosulfan) during this timeframe has not always resulted in adequate control. For Thionex to work against twig aphids as well as woolly adelgids, it should be applied from mid-April through budbreak.

**Organic Production and Twig Aphids.** Either because more predators are present or because less nitrogen fertilizer is used, organically grown Christmas tree typically have fewer problems with twig aphid damage. Trees may be heavily damaged one year, and then not for several years. Twig aphids themselves provide food for predators, perhaps resulting in fewer problems with other pests.

## Balsam Twig Aphid Scouting

Scouting for twig aphids starts with knowing if there are problems with any of the other pests of Fraser fir. If the trees need to be treated for the balsam woolly adelgid, spruce spider mite, or hemlock rust mite, there is no need to scout for twig aphids. When controlling these pests, the twig aphid can also be controlled.

If none of these pests are a problem, make the first assessment for twig aphids after April 15. This is the average date for all the BTA eggs to be hatched. Examine 10 to 15 trees spread out over a block of up to 2 acres in size. A block of trees can include fields that were all planted at the same time and managed the same way.

Place a white piece of paper on something firm like a clipboard into the lower third of the canopy, and beat the branches over it several times, shaking loose any aphids that might be present. A sheet of paper laminated in plastic on both sides will last through the spring. White plastic plates also work well.

Use a handlens while scanning the paper for aphids, as immatures are very small. Count the total number of aphids found on each sampled tree. Also make note of any predators, particularly hover fly larvae, lady beetles and their larvae.

Keep track of both the number of trees that had aphids and the total number of aphids. The economic threshold is the number of a pest where damage will start to occur. That threshold is small for the BTA. If more than three aphids are found on more than two trees, treatment is probably necessary. Remember that over the next month as the trees break bud, the few aphids found are quickly reproducing. Their numbers can shoot up from just one or two aphids shaken out of a tree to more than a hundred.

A second scouting trip made just as trees are breaking bud is recommended to assure that aphid numbers aren't increasing to damaging numbers.

## Pesticide Application

If the decision is made to treat, the material must be applied before the trees start to break bud. Once the buds break, the aphids move into the tiny shoots feeding on the new needles where they are protected from any pesticide application. A large number of cones in the trees can also compromise control, as aphids will hide under the cone bracts. Removing cones from the field before pesticides are applied will increase control. Don't just drop the cones on the ground next to the tree, as the aphids will crawl out of them back into the tree. If cones are an issue, trees can be successfully treated within about a week after first cone hatch as the bracts are not fully formed yet. If there is any question as to whether aphids are present under the bracts, pull several cones out of trees to examine them.

**Materials for Twig Aphid Control.** Any good insecticide will give control of twig aphids, which are not that hard to kill. Adequate coverage for twig aphid control can be obtained from a backpack sprayer, backpack mistblower, high-pressure hydraulic sprayer with a handheld gun, or a tractor-driven air-blast mistblower. Treatments must be made before the trees break bud. Treatments made before the cones break bud will result in better controls if many cones are present. Treatments can be made several weeks to several months before bud break, depending on how long the material will last on the tree. When targeting twig aphid control, however, most growers will apply chemicals in April or early May. Thionex (esfenvalerate) applications should be made after mid-April.

**The Link Between Twig Aphid Controls and Rust Mites.** It is important when controlling twig aphids to remember that some materials may create future problems with rust mites. The use of synthetic pyrethroids in the spring, summer, and early fall especially have sometimes resulted in an outbreak of rust mites the following spring. Therefore, fall applications with these materials are preferable. However, rust mite outbreaks are not guaranteed and rust mites can become a problem even if these materials are not used. Mites are also easily controlled with horticultural oil or miticides. Just be aware that the use of these materials can make rust mites more of a problem, and be ready to scout for these pests.

**Spring Applied Oil.** Most insecticides are applied near bud break to control twig aphids. However, a 2% solution (2 gallons oil in 100 gallons of water) can be used in mid-March prior to egg hatch to control the aphids. Applications must be thorough to smother each egg. Use a high quality oil with 92% or greater unsulfonated residues (a figure that will be on the label). Agitation is needed to keep the oil mixed with the water to insure control and reduce potential problems with burn. There are encapsulated oils now on the market

which do not require agitation, though they are more expensive. Be sure to scout in mid April to determine if controls have been adequate.

**Scouting after Treatment.** There are several factors that can compromise chemical control of twig aphids. Treatments made with air-blast mistblowers especially can fail if too many rows are being treated for the size of sprayer used. It is important to determine if twig aphids were controlled. Scout for twig aphids 3 to 14 days after treatment using the same method as described above. If many aphids are found, it may be necessary to retreat.

**Retreatment.** If the window for treatment is missed and the buds have already broken, or if the trees were treated unsuccessfully, retreatment is possible. Certain systemic chemicals such as Dimethoate work well up to two weeks after bud break. After that, even if the chemical controls the aphids, needle growth has reached the point where the curl will be permanent. Retreating can also kill natural predators that are feeding on the aphids or spruce spider mites. Therefore, though retreatment is possible, it may not be the best thing to do. Consult with your county extension agent to help assess if retreatment will be cost effective.

Prepared by:  
Jill Sidebottom, Ph.D.  
Area Extension Forestry Specialist, Mountain Conifer IPM  
Extension Forestry, College of Natural Resources

Original Christmas Tree Note written September 1996. Update November 2009

Recommendations for the use of agricultural chemicals are included in this publication as a convenience to the reader. The use of brand names and any mention or listing of commercial products or services in this publication does not imply endorsement by North Carolina Cooperative Extension nor discrimination against similar products or services not mentioned. Individuals who use agricultural chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage regulations and examine a current product label before applying any chemical. For assistance, contact your county Cooperative Extension agent.

Distributed in furtherance of the acts of Congress of May 8 and June 30, 1914. North Carolina State University and North Carolina A&T State University commit themselves to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age, veteran status, or disability. In addition, the two Universities welcome all persons without regard to sexual orientation. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating..

