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Nantucket Pine Tip Moth Recommendations

By John J. Riggins

Introduction

Pine tip moths problems are the most common question I receive from landowners. There are three species of pine tip moths that damage pine seedlings in the Southeast. All three species have similar life cycles, infest basically the same species of pines, and cause similar damage. However, the most damaging and widespread species is the Nantucket pine tip moth (*Rhyacionia frustrana*).

NPTM (Fig. 1) can have 3-5 generations in Mississippi, depending on latitude (Fettig, et al. 2000). See http://www.srs.fs.usda.gov/pubs/rp/rp_srs018.pdf for more information regarding NPTM generations and emergence dates in Mississippi.

Hosts

Nantucket pine tip moths (NPTM) can attack nearly all species of native and exotic pines that grow in the eastern U.S., with the notable exceptions of longleaf and eastern white pine. In the South, loblolly and shortleaf pines seem to be the preferred hosts.

Damage

NPTM larvae feed on the developing shoots of their host pines. After hatching, the tiny larvae feed on the outside of the shoot for a short time (remember for later…this is important from a control standpoint). The older larvae then build a protective silken web at the base of the bud (Fig. 2), and then tunnel into the center of the growing shoots where they feed. This feeding usually kills the shoot, and can be worsened by the fact that several larvae can infest the same shoot when populations are extremely high.

Feeding damage and number of larvae are generally greater in the upper portion of the tree, with the leader and other shoots in the upper one-third of the tree usually preferred by NPTM. This is likely because the vigorously growing buds at the top of the tree tend to be higher in Nitrogen content, which benefits larval development.

In severe infestations, trees less than 3 feet tall can be killed. However, stunted growth and deformation of the main stem are the most common damages. In a chronic, persistent multiple year infestation where nearly 100% of shoots are killed each year, growth can completely stall. Death of the leader on less vigorously growing trees can often lead to growth deformities such as crooking, forking, compression wood, and “bushiness”. These growth deformities reduce the value and merchantability of timber at harvest.

Signs and Symptoms

The initial symptoms of NPTM infestations are the reddening and browning of lateral shoots and/or leaders of young pines (Fig. 3). Upon closer inspection, infested tips will often be covered with fine silk webbing and resin. As the tips begin to die, they turn brown, shrivel, and become brittle. If broken off, the inside of an infested tip will be hollowed out by the activities of the larva. Depending on the time of year, larvae (Fig. 4) or pupae (Fig. 5) may also be present inside the tips, and are relatively easy to find by breaking off infested tips and looking inside. Trees in older infestations will often exhibit growth deformities, such as

multiple leaders, crooking, forking, compression wood, and "bushiness".

Factors Associated with NPTM Severity

Several factors may affect the severity of NPTM infestations in any given stand. The first is the species of pines planted on the property. Loblolly pines are most often the target of NPTM's. Additionally, plantations of preferred hosts like loblolly pines create a massive amount of food and habitat for NPTM that is conducive to NPTM population outbreaks.

Loblolly is also probably preferred because it has a tendency to produce new succulent shoots after a previous shoot has been damaged by tip moth larvae. This creates multiple fresh shoots for re-infestation by other NPTM larvae.

The second factor is the spacing of seedlings, and the density, diversity, and height of the flowering herbaceous layer underneath and surrounding the pine seedlings. This is because most severe NPTM infestations are caused by a violation of one central principle: NPTM prefer open-grown, vigorously growing hosts.

Open grown trees are preferred for several reasons. First of all, there are many more branches and tips on open grown trees, automatically creating more food and shelter for tip moth larvae. Second, open grown trees are often fast growing and shoots contain more nutrients (like nitrogen) that NPTM prefer.

Therefore, any practice that creates open grown trees or decreases the flowering herbaceous layer around a young plantation should be avoided. Grazing and mowing are prime examples of management strategies that will usually worsen NPTM infestations. Additionally, some evidence indicates that intensive management activities such as fertilization can make NPTM population fluctuations more volatile, and potentially lead to increased population levels (Nowak and Berisford 2000).

Control Strategies

Tip moth control is a much debated subject. Predicting the value of the commodity more than 2 decades into the future is nearly impossible, so it is hard to predict the cost-benefit outcome of treatment vs. letting nature run its course. Management goals are really the deciding factor. If saw-logs are the primary management goal, treatment during the first 3 years is somewhat more advisable than if pulpwood is the primary goal. Most severe infestations will have little impact on pulpwood stands at time of harvest, since wood volume rather than quality is the primary limiting factor. Generally speaking, most infestations only reduce growth, and might elongate the rotation by 2 or 3 years. However, some data suggest that chemical treatment of tip moths is warranted if more than 30% of tips are infested, since foregoing treatment could lengthen the rotation age by three years or more (Asaro et al. 2006). Other high-value stands such as seed orchards, nurseries, Christmas tree plantations, and ornamentals are also more commonly recommended for direct control measures.

If control is warranted, it is best to carry it out during the first three years after out-planting. This is when the trees are most susceptible, and also when it is cheapest to apply the insecticides. Once trees become large enough to necessitate aerial application of insecticides, the cost becomes exponentially greater. It also "nips the problem in the bud" (pardon my pun) before any growth deformities can occur.

Timing of application is critical. It should occur when the majority of young larvae are exposed and feeding on the outside of the shoot, but before they burrow into it. The right time to spray can be determined using traps baited with pheromones (approximately 5-7 days after peak adult trap catch), or with models based on weather data.

In the past, insecticide treatments were often made during all three generations for the first 2-3 years. However, research indicates that treatment during the first generation of the first and second years after out-planting can provide adequate control, eliminating costs associated with four or more treatments that would have been recommended during the first 2-3 years (Fettig et al. 2000).

Lastly, as a final recommendation, I suggest usage of a target-specific insecticide (such as one containing an active ingredient called Spinosad) that only kills Lepidopterans (moths and butterflies). Broad spectrum insecticides can kill many of the natural enemies of NPTM (more than 30 parasitoids are known), and lead to subsequent flare-ups of NPTM. Although the cost of target-specific insecticides may greater than other insecticides, the benefits should be longer lasting and avoid creating future problems from lack of natural enemies to help in controlling NPTM.

For additional information contact:

Mississippi Forestry Commission Local Office

or

Dr. John J. Riggins
johnjriggins@gmail.com

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Figure 1: An adult Nantucket pine tip moth.

Figure 2: Webbing and resin at base of bud, including tip moth infestation.

Figure3: Dead leader caused by tip moth infestation.

Figure 4: Nantucket pine tip moth larvae.

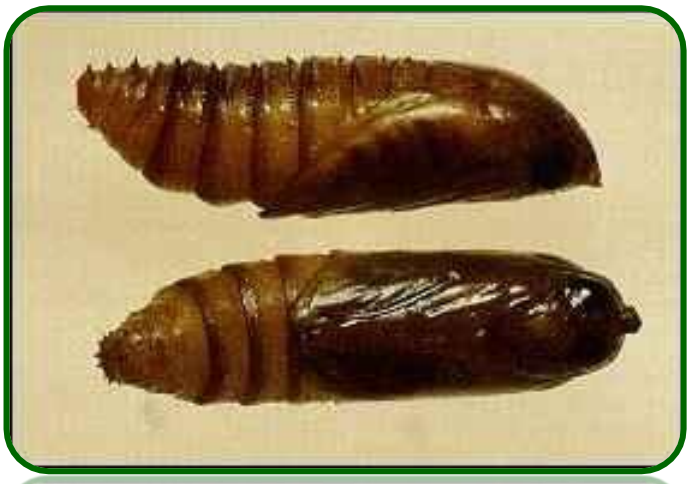

Figure 5: Nantucket pine tip moth pupa.