Nantucket Pine Tip Moth

Rhyacionia frustrana

Description:

Immature Stages – The egg is slightly convex and about 1/32 inch (0.8 mm) in diameter. It is opaque white when laid, but turns yellow to medium orange as it matures. The very small, young larva is cream colored with a black head; the late instar larva is light brown to orange and about 3/8 inch (9 mm) long. The pupa is light to dark brown and about ¼ inch (6 mm) long.

Adult Stages – When the adult emerges, gray scales cover its head, body, and appendages, except for the forewings, which are covered with brick-red and copper-colored patches separated by irregular bands of gray scales.

Biology:

Life Cycle – Pine tip moths overwinter as pupae within pine shoots and emerge as adults in December to April, depending on the location. Adults are crepuscular, meaning that they are most active at twilight. After mating, females will lay eggs on pine needles and shoots. Larvae are initially cream colored with a black head. More mature instars develop a yellow to orange color and are 9-10 mm long at full maturity. First instars will mine needles, while second instars feed on bud axils and produce the tent, which will be the first obvious sign of NPTM feeding. Later instars enter the pine shoots where they feed in a protected location and damage the apical meristem, killing the bud. The larvae then pupate within the stem before emerging. Depending on the region, NPTM can have anywhere from two to five generations annually. Temperature influences the number of generations NPTM has in a year. Numerous generations per year means that there are numerous times for NPTM to negatively affect the growth of new pine tips.

Damage to Crop:

NPTM causes reduced tree growth and stem form defects in loblolly pine (*Pinus taeda L.*), the most commercially important pine species in the southeastern US. NPTM is the only tip moth species in the eastern United States that causes economic damage to commercial pine trees. In the southeast, preferred hosts of NPTM are loblolly, shortleaf (*Pinus echinata* Mill.), and Virginia (*Pinus virginiana* Mill.) pines. However, most attention is focused on NPTM damage to loblolly pine, due to its financial importance. Plants grown in monoculture (single species plantings) can be especially susceptible to insect pests, because abundant host resources are in proximity. In addition, with monocultures in general, there is a decreased diversity of natural enemies. Damage to seedlings and saplings occurs during the NPTM larval stages (instars). First instars mine the needles, causing little damage, and damage is then caused by older instars boring into the vascular tissue of the shoots. Obvious evidence of pine

tip moth infestation typically includes resin flow on the bud or near the shoot terminal. However, with careful observation, NPTM tenting and resin droplets at the base of needles from 1st instars mining may be viewed earlier in the infestation. Tenting is a bit of webbing on the very tip of the pine shoot that is produced by second instar larvae. Resin can coat the webbing, giving the tent an iridescent appearance. Once the larva enters the bud or shoot it is protected within the tissue of the plant. NPTM damage will cause the fresh green pine tip to turn brown and die once the vascular tissue is damaged.

Management:

Effective suppression can be difficult due to numerous generations per year and feeding within the pine stem during part of their lifecycle. Contact insecticides have been used for NPTM suppression for decades and can be effective; however, timing can be difficult, labor intensive and costly. Optimal spray time periods were developed to give land managers guidance on when to treat each NPTM generation based on location. However, spray timings were based on temperature data from 1950-2000, thus, NPTM generation timing may now be shifting in response to climate variation. One suggested tactic to make spray timing more effective is to only apply contact insecticides to the first NPTM generation each year. There is evidence that using this tactic for two consecutive years after pine planting can be as effective as spraying every generation throughout the year.

More recently systemic insecticides have been used for NPTM suppression. Systemic insecticides are applied to the soil, taken up through the roots, transported throughout the whole plant, and are effective longer than contact insecticides, thus removing some of the timing issues of contact insecticides. Imidacloprid and fipronil have been used for young pine trees and can be effective for NPTM suppression. There is potential for systemic insecticides to enhance tree growth and vigor through the suppression of NPTM populations. Despite having the option of both contact and systemic insecticides, definite thresholds for treatment have not been developed, and decisions on best management practices remain difficult.

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