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Balsam Gall Midge (Paradiplosis tumifex) in Maine

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Introduction

The balsam gall midge (Paradiplosis tumifex) is a pest of balsam fir trees and is considered to be an economic pest of Christmas tree plantations in Maine. It is found throughout the range of its principal hosts, balsam fir (*Abies balsamea*) and Fraser fir (*Abies fraseri*). Economic injury is inflicted in the form of unsightly galls which develop in the current year's growth as a result of feeding by the larval stages (Fig. 3). Marketability is further reduced by the premature dropping of galled needles during current and subsequent years making control of this pest critical in the years leading up to market (Fig. 4).

Biology

The life cycle of the balsam gall midge begins when adult female midges emerge from the thatch of the plantation floor, take flight, mate, and lay on average 120 eggs in the bud scales of newly developing shoots (Fig. 2). These eggs hatch in 2–3 days. The hatched first instar larvae settle on the needle and immediately begin feeding. In response to feeding, cells in the needle elongate and divide, quickly enveloping the larva in the newly forming gall. Larvae feed throughout the spring and summer, undergoing periodic molting as they develop into their second and third instar forms. The larvae then exit the gall in September and overwinter in the thatch of the plantation floor. In the spring, larvae pupate, undergo a complete metamorphosis, and emerge as adults. The winged adult's mate and the female again lays eggs, completing the life cycle (Fig. 1).

Management

Avoidance

Planting a late-flushing variety of balsam fir (*Abies balsamea*), Fraser fir (*Abies fraseri*), or Canaan fir (*Abies balsamea* var. phanerolepis) reduces damage through avoidance of the egg-laying period. Studies conducted in Maine during

Photo: Ronald S. Kelley, Vermont Department of Forests, Parks and Recreation, Bugwood.org

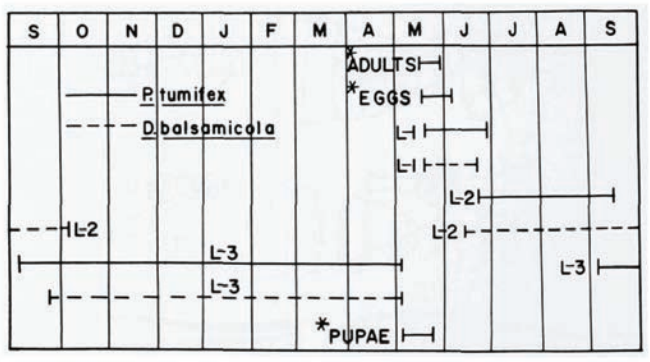

Fig. 1. Annual life stages of Paradiplosis tumifex and Dasineura balsamicola.
Image: University of Maine Experiment Station Technical Bulletin 151.

the 1970s demonstrated the use of late-flushing varieties of balsam fir in reducing gall formation by 52.3% in the case of late-May-flushing varieties and by 96% in the case of early June-flushing varieties [3]. Removal and burning of trees that are unmarketable due to severe needle loss and gall formation can also help reduce the population the following year. However, for this practice to achieve the intended results, the removal and burning must occur before the larvae leave the galls in September. Be sure to obtain all relevant permits and follow appropriate local and state guidelines before and during burning operations.

Monitoring and Scouting

Monitoring for adult midge can include setting yellow sticky traps in the top portion of the canopy (Fig. 5), sweeping around trees known to be infested during the prior season (Fig. 6), or ground placement of bottomless wooden boxes with a hole covered by a looking glass to allow for observation. Monitoring of traps should begin in mid-to-late April and continue through budbreak and early flushing in balsam fir. Scouting during the summer months allows for the observation of galled needles and the identification of affected trees. Midsummer is an ideal time to assess gall incidence and mark trees for removal or treatment the following spring.

Biological Control

Populations of the balsam gall midge are reduced in part through parasitism by parasitoid wasps (Platygaster species), occasional predation by mites and other arthropods, and most principally through the activity of its inquiline, Dasineura balsamicola. The term 'inquiline' refers to D. balsamicola occupying the living space of P. tumifex to its detriment. D. balsamicola feeds on the gall formed by P. tumifex but is incapable of creating the gall itself. Once inside the gall, the larvae of D. balsamicola often out number and out compete the larvae of P. tumifex, leading to reduced survival, which can eventually result in

Fig. 2. Orange-bodied female adult balsam gall midge (Paradiplosis tumifex) ovipositing eggs onto breaking bud of balsam fir on May 18, 2024 in Falmouth, Maine.

Fig. 3. Current year growth of a Balsam fir twig with high incidence of galled needles taken during scouting on July 23, 2024 in Falmouth, Maine.

population collapse [3]. Scouting and spot treatment rather than plantation-wide treatment with insecticides can help to conserve these biological control agents while maintaining populations below damaging levels. This approach also reduces the cost of treatment and limits the economic injury caused by the balsam gall midge.

Chemical Control

Application of insecticide should be timed to coincide with the life stage that is most vulnerable to the treatment. Until the early 2020s, when the products were banned in Maine, the most common insecticide used to control balsam gall midge contained chlorpyrifos (Lorsban), targeted the larval stage, and needed to be applied during early shoot elongation [3]. By contrast, currently registered insecticides known to be effective for control of balsam gall midge, such as bifenthrin (OnyxPro) and cyclaniliprole + flonicamid (Pradia™), target the adult midge and should be applied when adults are first observed in May. This life stage usually coincides with bud break in the earliest flushing balsam fir varieties. A single well-timed application reduces the population below damaging levels (Table 1) [1][2]. Scouting should take place during the summer months when galls are visible and before needles have been shed. Insecticide applications are economical when at least 10% of the current year's shoots have galled needles. One additional application, 10 to 14 days after the first, may be needed when infestation is severe, or when galls have formed on the needles of 50–60% of the current year's shoots. For more specific recommendations, contact your local Extension Sustainable Agriculture Educator.

Always apply pesticides according to the product label. Contact the Maine Board of Pesticides Control at 207.287.2731 for information on applicator licensing requirements. Pesticides must be registered for use in the state. Product registration can be found by searching the National Pesticide Retrieval System or by contacting the Maine Board of Pesticides Control at pesticides.registrar@maine.gov.

Fig. 4. Extensive defoliation caused by balsam gall midge (Paradiplosis tumifex) activity.

Fig. 5. Yellow-sticky trap is attached to balsam fir in the spring of 2023 in Falmouth, Maine.

Fig. 6. Orange-bodied adult female balsam gall midge (Paraplidosis tumifex) captured with sweep net, spring of 2023 in Falmouth, Maine.

References and Further Reading

1. Johnson, B.W. 2025. Efficacy of cyclaniliprole + flonicamid for balsam gall midge control on balsam fir grown for Christmas trees in Maine, 2024. *Arthropod Management Tests*. https://doi.org/10.1093/amt/tsaf100
2. Kelley, R.S. 2009. Management of the balsam gall midge in Christmas tree plantations. Vermont Department of Forests, Parks and Recreation.
3. Osgood, E.A., Bradbury, R.L. and Drummond, F.A. 1997. The balsam gall midge–An economic pest of balsam fir Christmas trees. Maine Agricultural Experiment Station Technical Bulletin 151.
4. Pest Fact Sheet 49. Balsam Gall Midge. UNH Cooperative Extension.

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