

# Adelgids Studies Final Report

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## Executive Summary

Adelgids (Hemiptera: Adelgidae) are pests in western Canadian conifer seed orchards and are of particular importance on spruce, Douglas-fir and larch in southern BC. This report summarizes research conducted from fall 2006 – spring 2009. Research for this project has been completed and a draft of my thesis has been written.

The research goals of our project included the following:

- To determine if the galling susceptibility of spruce has a genetic basis.
- To determine which adelgid life stage (fundatrix and her offspring the gallicolae) induces the gall formations on spruce.
- To look at the changes in the host tissues to verify the role of fundatrices and gallicolae and attempt to describe the developmental morphology of a gall as it forms.
- Additionally we attempted to associate the different adelgid gall structures with the adelgid species that induces the gall.

We determined that spruce susceptibility to adelgid induced galling is under strong genetic control and this trait is heritable, indicating that selection for reduced susceptibility would be possible. From this study it was evident that various families of trees showed different levels of susceptibility to galling and including trees from less susceptible genotypes in conifer seed orchards could be a useful management strategy.

From manipulative laboratory experiments and examining the tissue structure of spruce shoots during phases of gall initiation and growth, we determined that fundatrices induce galls and the gallicolae complete gall formation. Gallicolae of a non-related fundatrix are able to successfully colonize induced galls. Furthermore, without one of the life stages present galls are not formed. Current management at the Kalamalka Seed Orchard targets the fundatrices in pest management efforts and this study supports this approach. However, further investigation of control strategies for fundatrices could provide more effective or alternative management solutions.

We attempted to determine if adelgid induced galls were species-specific. It is evident that the two different adelgid genera, *Adelges* and *Pineus*, induce structurally unique galls. Within the *Adelges* genera we also found two species (*A. cooleyi* and *A. lariciatus*) to induce characteristic galls with slight variation in the structures. Within the *Pineus* genera we found more variation in structures induced by a single species and were not able to generalize the galls. Having a general idea of what species-specific galls look like could be useful for monitoring species such as *A. cooleyi* and *A. lariciatus* considering the crops of concern are spruce, larch and Douglas-fir. A more detailed review of adelgid galls and the inclusion of DNA barcode data, to verify the species identification, would clarify the uncertainties observed within the *Pineus* group and increase the confidence of our observations. A future review would include increasing the number of galls sampled and identifying the adelgids that emerge from the galls with DNA barcoding, versus using morphological characteristics of the alates as was done in this study.

For any further comments or questions regarding the adelgid research conducted at the Kalamalka Research Center or the Skimikin Seed Orchard feel free to contact Babita at: babitab@interchange.ubc.ca