

RESISTANCE OF HEMLOCK TO *ADELGES TSUGAE*: PROMISING NEW DEVELOPMENTS

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ABSTRACT

Hemlock (*Tsuga*) species native to western North America and Asia are considered to have some degree of resistance to feeding by hemlock woolly adelgid, *Adelges tsugae* Annand. We compared the resistance of seven hemlock species growing in arboreta in the northeastern U.S. to *Adelges tsugae* Annand by artificially infesting trees with *A. tsugae* ovisacs and subsequently counting the number of progrediens (same generation) and sistens (next generation) that developed. Based on this assessment, the most resistant species was *T. chinensis* (Franch.) E. Pritz, followed (in declining order) by *T. diversifolia* (Maxim.) Mast and *T. mertensiana* (Bong.) Carrière; *T. sieboldii* Carrière and *T. heterophylla* (Raf.) Sarg.; and lastly, *T. canadensis* (L.) Carrière and *T. caroliniana* Engelm. Aphids and other insect families in the Aphidoidea, which includes adelgids, are known to have a limited tolerance to some terpenoids. Analysis of terpenoids from the hemlock species under study showed that three interspecific groupings were evident: 1) *T. canadensis* and *T. caroliniana*, 2) *T. chinensis*, *T. sieboldii*, *T. diversifolia*, and *T. heterophylla*, and 3) *T. mertensiana*. Analysis of terpenoids in *T. canadensis* tissues showed that terpenoid concentrations are lower in the tissues in which *A. tsugae* feeds (the leaf cushion) than in the needles, and terpenoid concentrations are higher in developing needles and leaf cushions than in the respective tissues after they have matured. Terpenoid profiles in *Tsuga* may correspond to the relative susceptibility/resistance of species to *A. tsugae* and the insect may decrease its exposure to certain terpenoids by feeding in the leaf cushion and avoiding developing tissues.