The evaluation of the resistance level of the Ulleung hemlock to hemlock woolly adelgid, *Adelges tsugae*

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Abstract

The hemlock woolly adelgid (HWA), *Adelges tsugae*, is an invasive insect pest from Asia that has been decimating eastern hemlock stands since its accidental introduction into North America in 1951. Over the past six decades there has been extensive research to understand the biology of HWA and the differences in resistance levels to HWA between the nine hemlock species. In 2008 a new hemlock species was discovered from Ulleung Island, off the coast of Korea. There has not been any research that has examined if the Ulleung hemlock is susceptible, resistant, or immune to HWA. The main focus of this thesis was to compare the resistance level of HWA of the Ulleung hemlock to that of *Tsuga canadensis*, *Tsuga diversifolia*, and *Tsuga chinensis* by using an artificial infestation methodology. The results of this thesis suggest that the Ulleung hemlock is resistant to HWA infestation, and as found in previously performed studies, *Tsuga canadensis* is susceptible, *Tsuga diversifolia* is resistant and *Tsuga chinensis* is immune.

Another part of this thesis involved an examination of the life cycle of HWA and its relationship to the phenology of various hemlock species. A theory was formulated that there is a correlation between when each hemlock species start and stop growing (hemlock phenology), the hemlock woolly adelgid life cycle, and the resistance level of each species to HWA. After extensive monitoring of the life cycle of HWA and the phenology of each hemlock species, results do not support any correlation between the
date of bud break, HWA life cycle patterns, and where each hemlock falls in the HWA resistance spectrum.

The two sections of this thesis were an examination of why hemlock species are different in their resistance levels to hemlock woolly adelgid. Presently there are no concrete answers to this question, but with results from future studies, conclusions can be made.