

**Title** Endogenous and exogenous ethylene induces needle abscission and cellulase activity in post-harvest balsam fir (*Abies balsamea* L.)

**Author** Mason T. MacDonald, Rajasekaran R. Lada, Martine Dorais and Steeve Pepin

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### **Abstract**

Post-harvest needle loss is a major problem for balsam fir and other Christmas tree species. Recent evidence has implicated ethylene as a signal responsible for post-harvest needle abscission, but enzymological changes remain unknown. The objective of this study was to identify and quantify cellulase activity associated with endogenous and exogenous ethylene-induced abscission. An experiment was designed with three treatments (control, endogenous ethylene, or exogenous ethylene) with five replicates. Key response variables include needle retention duration, xylem pressure potential, ethylene evolution rate, and cellulase activity. Two complimentary methods were used to assess cellulase activity: a cellulose plate digestion and zymography. The results confirm ethylene as a signal for post-harvest abscission and identify ethylene-induced cellulase. Ethylene evolution was typically between 15 and 16  $\mu\text{L g}^{-1} \text{h}^{-1}$ , but there was no difference among the three treatments. However, exogenous ethylene significantly decreased needle retention by 60% and resulted in a sixfold decrease in xylem pressure potential. In addition, cellulase activity increased by 8- and 12-fold in endogenous and exogenous ethylene-induced abscission, respectively, compared to the control. Identification of ethylene-induced cellulase activity has increased our understanding of the post-harvest needle abscission process and confirms ethylene's role as a signal molecule.

<http://www.springerlink.com/content/612t82u4v4681jrh/fulltext.pdf>