

# Herbivory and climate change factors may significantly increase BVOC emissions from boreal conifers

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Boreal conifer forests are sources of biogenic volatile organic compound (BVOC) emissions into the atmosphere. Global warming exposes boreal trees to biotic stress caused by insect outbreaks and they are also affected by abiotic climate change factors.

A recent study from the University of Eastern Finland shows that the combination of insect outbreaks and climate change factors may significantly increase BVOC emissions of conifers in northern Europe. The expected increases in BVOCs may affect atmospheric chemistry and the global climate through the formation of secondary organic aerosols in the atmosphere.

Needle damage caused by pine sawflies on Scots pine and bark beetle invasion on Norway spruce trunks substantially increased the BVOC emissions from pine shoots and spruce bark, respectively. Insect herbivores and abiotic climate change factors (warming, elevated ozone and increased soil nitrogen availability), both individually and in combination, had strong impacts on BVOC emissions of Scots pine.

The findings presented in the doctoral dissertation of Rajendra Prasad Ghimire, MSc, help in understanding the risks posed by climate change induced insect outbreaks for northern ecosystems. Data on emission responses can be used in, for example, modelling of the impacts of climate change on the secondary aerosol forming capacity of boreal

forests.

With the aim of assessing BVOC emissions from the shoots and tree bark surface of conifers in response to biotic stress, pine seedlings were experimentally exposed to insect herbivores in growth chambers and in an open-field exposure site. In addition, naturally insect-infested spruce trees were studied in forest site experiments.

In order to evaluate the emission responses under multiple biotic and abiotic factors, pine seedlings were exposed to herbivory, warming, elevated ozone and higher nitrogen supply in the open-field exposure site. BVOC samples were collected both from pine shoots and rhizosphere and spruce bark surface using dynamic headspace sampling technique followed by analysis with gas chromatography-mass spectrometry.

**More information:** Effects of Herbivory and Climate Change Factors on BVOC Emissions from Boreal Conifers, [epublications.uef.fi/pub/urn\\_i...78-952-61-2252-6.pdf](https://publications.uef.fi/pub/urn_i...78-952-61-2252-6.pdf)

Provided by University of Eastern Finland

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