GENERAL INFORMATION

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year	2010
English title	Variation in biogenic volatile organic compound emission pattern of *Fagus sylvatica* L. due to aphid infection
original title	
reference	Atmospheric Environment 44
pages	227-234
type	article (a1)
ecosystem service	regulating – air quality
keywords	biogenic volatile organic compounds (BVOCs)
taxa	*Fagus sylvatica*, *Phyllaphis fagi*
project	IMPECVOC: Impact of Phenology and Environmental Conditions on BVOC Emissions from Forest Ecosystems
supervisor	
institution	Research Group Environmental Organic Chemistry and Technology, Laboratory of Plant Ecology (Ghent University), Belgian Institute for Space Aeronomy
location	pdf, hardcopy
data	

MATERIALS & METHODS

study area	5n (measuring tower)
time period	May-October 2008
goal	Investigate which compounds are emitted by common beech and the relationship between emission of some compounds and woolly beech aphid. Point at the variability in BVOC emissions.
set-up	field measurements: beech next to the measuring tower - branches at 9, 16, 22, 24 m above ground level - vegetation period 2008 growth chamber measurements (15-27°C, light between 8 am and 8 pm) - 3 potted beech trees (3-4 years old) - vegetation periods of 2007 and 2008 - branches at 1 m above ground level dynamic branch enclosure in cuvettes, BVOCs collected on multi-adsorbent tubes
data collection	enclosed branches: LAI, VOC levels - 32 samples of the forest tree, 27 samples in the growth chamber in 2007, 29 samples from the growth chamber in 2008 reference branches: LAI development between spring and fall background VOC levels
remarks	

ABSTRACT

Volatile organic compounds (VOCs) have been the focus of interest to understand atmospheric processes and their consequences in formation of ozone or aerosol particles; therefore, VOCs contribute to climate change. In this study, biogenic VOCs (BVOCs) emitted from *Fagus sylvatica* L. trees were measured in a dynamic enclosure system. In total 18 compounds were identified: 11 monoterpenes (MT), an oxygenated MT, a homoterpene (C14H18), 3 sesquiterpenes (SQT), isoprene and methyl salicylate. The frequency distribution of the compounds was tested to determine a relation with the presence of the aphid *Phyllaphis*

fagi L. It was found that linalool, (E)-b-ocimene, a-farnesene and a homoterpene identified as (E)-4,8-dimethyl-1,3,7-nonatriene (DMNT), were present in significantly more samples when infection was present on the trees. The observed emission spectrum from *F. sylvatica* L. shifted from MT to linalool, a-farnesene, (E)-b-ocimene and DMNT due to the aphid infection. Sabinene was quantitatively the most prevalent compound in both, non-infected and infected samples. In the presence of aphids a-farnesene and linalool became the second and third most important BVOC emitted. According to our investigation, the emission fingerprint is expected to be more complex than commonly presumed.

RESULTS

Overall, 18 compounds were detected in the emissions of common beech. The most prevalent monoterpene was sabinene, in 83 % of the samples without aphid infection, 45 % of the samples with aphid infection. The compounds isoprene, alpha-phellandrane, methyl salicate, (E)-4,8-dimethyl-1,3,7-nonatriene were also found in the beech leaf emissions, but have not been mentioned before in literature as compounds emitted by beech. The emission patterns of beech thus may be more complex than previously assumed.

Aphids were observed in 42 of the 88 cases (inside or outside the cuvettes). Sabinene was present in all the samples without aphids. Linalool, alpha-farnesene, and (E)-beta-ocimene were present in most aphid-samples. Methyl salicylate was present as much in aphid samples as in samples without aphids. For all the other compounds, except sabinene, significant differences were found between samples with or without aphids.

For branches with no aphids, sabinene was the most emitted monoterpene. Infected branches emitted much alpha-farnesene and linalool. Almost three times as much terpenoid was emitted by infected branches than by aphid-free branches. Aphid infection thus seems to have a large impact on BVOC emissions to the atmosphere.