Supplement to

Kivimäenpää M, Babalola AB, Joutsensaari J, Holopainen JK. 2020. Methyl Salicylate and Sesquiterpene Emissions are Indicative for Aphid Infestation on Scots Pine. *Forests*.

Table S1. Emission rates per needle area (ng cm^{-2} h^{-1}) of BVOCs from control and aphid-infested Scots pine saplings before aphid infestation and at different days after aphid infestation. Values are means (SE) (n=6, ^{+}n=5). Emboldened values indicate significant (*P < 0.05, ** P < 0.01, [a]t-test or [b]Mann-Whitney test) difference between the treatments within the sampling day.

	Before		7 days		17 days		19 days		23 days		26 days		33 days		39 days	
	Control	Aphid	Control	Aphid	Control	Aphid	Control	Aphid	Control	Aphid	Control	Aphid^{+}	Control	Aphid	Control	Aphid
Monoterpenes, MT																
Tricyclene	0.02 (0.01)	0.02 (0.01)	0.04 (0.02)	0.03 (0.01)	0.02 (0.01)	0.02 (<0.005)	0.02 (0.01)	0.03 (0.02)	0.01 (<0.005)	0.02 (0.01)	0.01 (0.01)	0.02 (<0.005)	0.03 (0.01)	0.05 (0.02)	0.02 (0.01)	0.02 (<0.005)
α-Thujene	0 (0)	0.01 (0.01)	0.01 (0.01)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)
α-Pinene	0.94 (0.30)	0.97 (0.34)	1.46 (0.52)	1.02 (0.28)	0.73 (0.31)	1.30 (0.70)	0.55 (0.19)	1.01 (0.35)	0.35 (0.11)	0.61 (0.21)	0.54 (0.25)	0.94 (0.11)	0.87 (0.32)	1.99 (0.70)	0.54 (0.24)	0.42 (0.10)
Camphene	0.12 (0.03)	0.12 (0.04)	0.24 (0.11)	0.16 (0.03)	0.12 (0.05)	0.12 (0.03)	0.10 (0.03)	0.19 (0.09)	0.09 (0.02)	0.14 (0.05)	0.10 (0.03)	0.15 (0.02)	0.15 (0.04)	0.32 (0.09)	0.09 (0.03)	0.06 (0.01)
Sabinene	0.01 (<0.005)	0.06 (0.06)	0.12 (0.09)	0.02 (0.01)	0.02 (0.01)	0.06 (0.04)	0.01 (0.01)	0.02 (0.01)	0.10 (0.09)	0.01 (<0.005)	0.01 (<0.005)	0.02 (0.01)	0.01 (0.01)	0.01 (<0.005)	0.01 (<0.005)	0.01 (<0.005)
β-Pinene	0.04 (0.01)	0.11 (0.05)	0.30 (0.17)	0.06 (0.01)	0.04 (0.01)	0.13 (0.10)	0.05 (0.01)	0.07 (0.02)	0.12 (0.10)	0.04 (0.01)	0.03 (0.01)	0.09 (0.03)	0.04 (0.01)	0.09 (0.03)	0.03 (0.01)	0.04 (0.01)
Myrcene	0.07 (0.03)	0.29 (0.21)	1.25 (1.11)	0.08 (0.03)	0.10 (0.02)	1.93 (1.89)	0.07 (0.02)	0.05 (0.02)	0.78 (0.68)	0.08 (0.06)	0.07 (0.04)	0.09 (0.03)	0.10 (0.04)	0.18 (0.07)	0.04 (0.01)	0.23 (0.19)
α-Phellandrene	<0.005 (<0.005)	<0.005 (<0.005)	0.03 (0.03)	0 (0)	0 (0)	0.02 (0.02)	<0.005 (<0.005)	<0.005 (<0.005)	0.01 (0.01)	0 (0)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)
Δ-3-Carene	0.19 (0.11)	1.48 (1.46)	2.15 (1.67)	0.17 (0.11)	0.33 (0.21)	0.18 (0.16)	0.19 (0.10)	0.29 (0.27)	1.56 (1.48)	0.07 (0.04)	0.06 (0.03)	0.03 (0.02)	0.14 (0.06)	0.13 (0.11)	0.17 (0.14)	0.06 (0.04)
α-Terpinene	<0.005 (<0.005)	0.001 (0.001)	0.026 (0.021)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	0.001 (0.001)	0 (0)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	0.001 (<0.005)	<0.005 (<0.005)	0 (0)
p-Cymene	0.01 (<0.005)	0.02 (0.01)	0.04 (0.03)	0.01 (<0.005)	0.01 (<0.005)	0.02 (0.02)	<0.005 (<0.005)	0.01 (<0.005)	0.09 (0.03)	0.06 (0.02)	0.01 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	0.02 (0.01)
Limonene	0.04 (0.01)	0.17 (0.11)	0.16 (0.09)	0.04 (0.02)	0.10 (0.03)	1.77 (1.73)	0.10 (0.05)	0.04 (0.01)	0.72 (0.58)	0.04 (0.01)	0.11 (0.07)	0.09 (0.04)	0.16 (0.09)	0.16 (0.07)	0.03 (0.01)	0.08 (0.07)
β-Phellandrene	0.08 (0.07)	0.25 (0.17)	1.53 (1.50)	0.01 (<0.005)	0.03 (0.01)	0.82 (0.81)	0.02 (0.01)	0.01 (<0.005)	0.37 (0.31)	0.02 (0.01)	0.02 (0.01)	0.06 (0.02)	0.03 (0.01)	0.06 (0.03)	0.01 (0.01)	0.08 (0.05)
1,8-Cineole	0.01 (<0.005)	0.01 (<0.005)	0.02 (<0.005)	0.02 (<0.005)	0.01 (<0.005)	0.02 (0.01)	0.01 (<0.005)	0.03 (0.01)	0.02 (<0.005)	0.02 (0.01)	0.02 (0.01)	0.03 (0.01)	0.02 (0.01)	0.04 (0.01)	0.01 (<0.005)	0.01 (<0.005)
(*E*)-β-Ocimene	<0.005 (<0.005)	<0.005 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	0.01 (0.01)	0.03 (0.02)	0.01 (<0.005)	0.02 (0.01)	0.01 (<0.005)	0.01 (<0.005)	0.01 (0.01)	0.02 (0.01)	0.02 (0.01)	0.03 (0.01)	0.02 (0.01)	0.02 (0.01)
γ-Terpinene	<0.005 (<0.005)	0.02 (0.01)	0.03 (0.02)	<0.005 (<0.005)	<0.005 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0.02 (0.01)	<0.005 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)
Terpinolene	0.01 (0.01)	0.08 (0.08)	0.13 (0.12)	0.01 (0.01)	0.01 (0.01)	0.02 (0.01)	<0.005 (<0.005)	0.02 (0.11)	0.11 (0.11)	<0.005 (<0.005)	<0.005 (<0.005	<0.005 (<0.005	0.01 (<0.005)	0.01 (0.01)	0.01 (0.01)	<0.005 (<0.005)

Table S1 Continued. Emission rates per needle area (ng cm^{-2} h^{-1}) of BVOCs from control and aphid-infested Scots pine saplings before aphid infestation and at different days after aphid infestation. Values are means (SE) (n=6, ^{+}n=5). Emboldened values indicate significant (*P < 0.05, ** P < 0.01, [a]t-test or [b]Mann-Whitney test) difference between the treatments within the sampling day.

	Before		7 days		17 days		19 days		23 days		26 days		33 days		39 days	
	Control	Aphid	Control	Aphid	Control	Aphid	Control	Aphid	Control	Aphid	Control	Aphid^{+}	Control	Aphid	Control	Aphid
Monoterpenes (cont.)																
Linalool	0 (0)	0 (0)	<0.005 (<0.005)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0 (0)	0 (0)	<0.005 (<0.005)
Camphor	<0.005 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	0.02 (<0.005)	0.01 (<0.005)	0.02 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)	0.01 (<0.005)	0.02 (0.01)	<0.005 (<0.005)	[a]**0.02*** **(0.01)**	<0.005 (<0.005)	<0.005 (<0.005)
Borneol	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0.02 (0.02)	<0.005 (<0.005)	[b]**0.02*** **(0.01)**	<0.005 (<0.005)	<0.005 (<0.005)
Terpinen-4-ol	0 (0)	<0.005 (<0.005)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0 (0)	0 (0)
α-Terpineol	0 (0)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0 (0)	0 (0)
Bornylacetate	0.01 (<0.005)	0.02 (0.01)	0.02 (0.02)	0.02 (0.01)	0.01 (<0.005)	0.01 (<0.005)	0.02 (0.01)	0.02 (0.02)	0.01 (<0.005)	0.02 (0.01)	0.01 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	0.05 (0.02)	<0.005 (<0.005)	<0.005 (<0.005)
Sesquiterpenes, SQT																
α-Copaene	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	0 (0)	<0.005 (<0.005)	0.01 (0.01)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0 (0)	0 (0)	0.01 (0.01)	0 (0)	<0.005 (<0.005)
β-Elemene	<0.005 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	[b]**0.01*** **(0.01)**	<0.005 (<0.005)	<0.005 (<0.005)
Longifolene	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	0 (0)
β-caryophyllene	0.01 (<0.005)	0.01 (0.01)	0.02 (0.01)	0.01 (0.01)	<0.005 (<0.005)	<0.005 (<0.005)	0.01 (0.01)	0.02 (0.02)	<0.005 (<0.005)	0.01 (0.01)	0.01 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)	[b]**0.04*** **(0.02)**	0.01 (0.01)	0.01 (0.01)
(*E*)-β-Farnesene	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0.01 (0.01)	0.01 (<0.005)	0.04 (0.03)	0.01 (<0.005)	0.07 (0.06)	0.01 (<0.005)	0.10 (0.06)	<0.005 (<0.005)	0.10 (0.07)	<0.005 (<0.005)	0.01 (0.01)
Aromadendrene	<0.005 (<0.005)	<0.005 (<0.005)	0.01 (0.01)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	0.01 (0.01)	0.03 (0.02)	<0.005 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0.02 (0.01)	0 (0)	<0.005 (<0.005)
α-Humulene	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)
(*E, E*)-α-Farnesene	0 (0)	0.01 (0.01)	<0.005 (<0.005)	0.04 (0.02)	0.01 (0.01)	0.01 (<0.005)	<0.005 (<0.005	0.39 (0.37)	<0.005 (<0.005)	0.75 (0.69)	0.01 (0.01)	[b]**0.70**** **(0.44)**	0.01 (0.01)	[b]**0.64**** **(0.43)**	0.01 (0.01)	0.16 (0.08)
α-Amorphene	<0.005 (<0.005)	0.01 (<0.005)	0.01 (0.01)	0.01 (0.01)	<0.005 (<0.005)	<0.005 (<0.005)	0.01 (0.01)	0.02 (0.02)	<0.005 (<0.005)	0.01 (0.01)	<0.005 (<0.005)	0.01 (<0.005)	<0.005 (<0.005)	[b]**0.05*** **(0.02)**	<0.005 (<0.005)	0.02 (0.01)
α-Muurolene	<0.005 (<0.005)	0.01 (<0.005)	0.01 (<0.005)	0.01 (0.01)	0 (0)	0 (0)	0.02 (0.01)	0.03 (0.02)	0.01 (<0.005)	0.02 (0.01)	0.01 (<0.005)	0.02 (0.01)	<0.005 (<0.005)	[a]**0.05*** **(0.02)**	<0.005 (<0.005)	0.03 (0.01)

Table S1 Continued. Emission rates per needle area (ng cm^{-2} h^{-1}) of BVOCs from control and aphid-infested Scots pine saplings before aphid infestation and at different days after aphid infestation. Values are means (SE) (n=6, +n=5). Emboldened values indicate significant (*P < 0.05, ** P < 0.01, [a]t-test or [b]Mann-Whitney test) difference between the treatments within the sampling day.

	Before		7 days		17 days		19 days		23 days		26 days		33 days		39 days	
	Control	Aphid	Control	Aphid	Control	Aphid	Control	Aphid	Control	Aphid	Control	Aphid+	Control	Aphid	Control	Aphid
Sesquiterpenes (cont.)																
δ-Cadinene	0.01 (<0.005)	0.05 (0.03)	0.02 (0.01)	0.03 (0.02)	<0.005 (<0.005)	<0.005 (<0.005)	0.04 (0.03)	0.05 (0.04)	<0.005 (<0.005)	0.02 (0.01)	0.02 (0.01)	0.02 (<0.005)	0.01 (<0.005)	[b]**0.09*** **(0.04)**	0.01 (0.01)	0.03 (0.01)
Cis-α-Bisabolene	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	[b]**0.01*** **(0.01)**	<0.005 (<0.005)	0.01 (0.01)
Green leaf volatiles, GLV																
(E)-2-Hexenal	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.01 (0.01)	0 (0)	<0.005 (<0.005)	0 (0)	0 (0)	0.02 (0.02)	0 (0)	0 (0)
(Z)-3-Hexen-1-ol	0 (0)	0 (0)	<0.005 (<0.005)	0 (0)	0 (0)	0 (0)	0 (0)	<0.005 (<0.005)	0.04 (0.04)	<0.005 (<0.005)	0.02 (0.02)	<0.005 (<0.005)	<0.005 (<0.005)	0.11 (0.11)	0 (0)	0 (0)
1-Hexanol	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	0 (0)	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	[b]**0.01**** **(<0.005)**	0.00±0.00	0.00±0.00
(Z)-3-Hexenyl acetate	<0.005 (<0.005)	0.01 (0.01)	0.01 (0.01)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	[b]**0.01*** **(<0.005)**	0.01 (0.01)	<0.005 (<0.005)	0.04 (0.03)	<0.005 (<0.005)	<0.005 (<0.005)	0.26 (0.25)	<0.005 (<0.005)	<0.005 (<0.005)
Benzenoids																
Methyl salicylate	0 (0)	<0.005 (<0.005)	<0.005 (<0.005)	[b]**0.02**** **(0.01)**	<0.005 (<0.005)	[b]**0.82**** **(0.36)**	<0.005 (<0.005)	[b]**1.00**** **(0.53)**	<0.005 (<0.005)	[b]**0.89**** **(0.39)**	<0.005 (<0.005)	[a]**1.83*** **(0.59)**	<0.005 (<0.005)	[a]**2.65**** **(0.98)**	<0.005 (<0.005)	[b]**1.23**** **(0.70)**
Total emissions																
MTs	1.57 (0.31)	3.67 (2.00)	7.59 (5.10)	1.66 (0.37)	1.56 (0.60)	6.50 (5.35)	1.17 (0.36)	1.85 (0.83)	4.38 (3.50)	1.18 (0.39)	1.02 (0.35)	1.59 (0.17)	1.60 (0.38)	3.25 (0.92)	1.02 (0.44)	1.09 (0.31)
SQTs	0.03 (0.02)	0.12 (0.06)	0.09 (0.04)	0.14 (0.06)	0.03 (0.02)	0.16 (0.11)	0.13 (0.09)	0.63 (0.43)	0.05 (0.02)	0.90 (0.80)	0.10 (0.05)	0.87 (0.52)	0.05 (0.01)	[a]**1.08*** **(0.56)**	0.06 (0.03)	0.29 (0.14)
GLVs	<0.005 (<0.005)	0.01 (<0.005)	0.01 (0.01)	0.01 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	<0.005 (<0.005)	[b]**0.01*** **(0.01)**	0.01 (0.01)	0.01 (<0.005)	0.06 (0.06)	0.01 (<0.005)	0.01 (<0.005)	0.41 (0.39)	<0.005 (<0.005)	<0.005 (<0.005)

+n=5. A few plant individuals emitted MTs α-fenchene and verbenene, SQTs β-cubebene, and 6 unidentified SQTs, and GLV cis-3-hexenyl-isovalerate. These compounds were not affected by aphid-infestation and are included in total MTs, SQTs and GLVs, respectively. Compounds for each group are shown in order of increasing retention t

Table S2. Average (SE) (n=6) of systemic BVOC emission rates (ng cm^{-2} h^{-1}) collected from an uninfested branch adjacent to an aphid-infested Scots pine branches and from control trees 39 days after aphid-infestation (Experiment 1). Compounds for each group are shown in order of increasing retention times. Differences between the treatments were not significant.

Compound	Control	Aphid-infested
Monoterpenes, MT		
Tricyclene	0.03 (0.01)	0.25 (0.20)
α-Thujene	<0.005 (<0.005)	0.05 (0.05)
α-Pinene	0.34 (0.07)	2.32 (1.69)
Camphene	0.08 (0.01)	1.13 (0.99)
Sabinene	0.04 (0.02)	0.10 (0.09)
β-Pinene	0.12 (0.09)	0.52 (0.48)
α-Phellandrene	0.01 (0.01)	0.04 (0.03)
Myrcene	0.68 (0.56)	3.17 (3.06)
Δ-3-carene	0.13 (0.08)	0.03 (0.02)
α-Terpinene	0.02 (0.01)	0.06 (0.05)
p-cymene	0.09 (0.02)	0.67 (0.59)
Limonene	2.27 (1.93)	0.27 (0.22)
β-Phellanderene	0.51 (0.42)	1.17 (1.12)
1,8-cineole	0.02 (<0.005)	0.03 (0.01)
(*E*)-β-Ocimene	0.03 (0.01)	0.15 (0.11)
γ-Terpinene	0.01 (<0.005)	0.04 (0.04)
Terpinolene	0.01 (0.01)	0.09 (0.09)
Camphor	0.01 (<0.005)	0.02 (0.01)
Borneol	<0.005 (<0.005)	0.01 (0.01)
Bornylacetate	0.01 (<0.005)	0.14 (0.12)
Sesquiterpenes, SQT		
α-Copaene	<0.005 (<0.005)	0.02 (0.02)
β-Elemene	<0.005 (<0.005)	0.04 (0.04)
Longifolene	<0.005 (<0.005)	<0.005 (<0.005)
β-Caryophyllene	<0.005 (<0.005)	0.12 (0.10)
(*E*)-β-Farnesene	0.01 (<0.005)	0.02 (0.02)
Aromadendrene	<0.005 (<0.005)	0.03 (0.03)
α-Humulene	<0.005 (<0.005)	0.02 (0.01)
unknown ST	0.03 (0.02)	0.04 (0.04)
(*E, E*)-α-Farnesene	0.05 (0.03)	0.31 (0.25)
α-Amorphene	0.02 (0.01)	0.07 (0.05)
α-Muurolene	0.07 (0.03)	0.11 (0.05)
δ-Cadinene	0.05 (0.02)	0.16 (0.10)
Cis-α-Bisabolene	0 (0)	<0.005 (<0.005)
Green leaf volatiles, GLV		
(E)-2-Hexenal	0 (0)	<0.005 (<0.005)
(*Z*)-3-Hexen-1-ol	0 (0)	0.01 (0.01)
1-Hexanol	0 (0)	<0.005 (<0.005)
(Z)-3-Hexenyl acetate	0.01 (0.01)	0.04 (0.04)
Benzenoids		
Methyl salicylate	<0.005 (<0.005)	0.01 (0.01)
Total emissions		
MTs	4.44 (3.09)	10.36 (8.62)
SQTs	0.28()0.09	1.04()0.72
GLVs	0.01 (0.01)	0.05 (0.05)