

'Which volatile organic compounds (VOCs) are emitted by trees, or show significant increases or decreases, under herbivory? How is this moderated by exposure to elevated CO₂, O₃, or both?' A systematic review and meta-analysis

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Why Systematic Review?

- Ever growing body of work
- Disparate research 'picture'
- Contradictory results (many studies but small sample sizes)
- Lack of general trends identified
- Up to date rigorous review in this field is needed

What are we looking for?

- Specific VOCs that can be strongly tied to herbivory
- General emission trends, perhaps across taxa or chemical class
- Understanding of how eCO₂ and O₃ can act as 'moderating factors' - how do they affect the VOC profile of trees? How variable are those effects?
- Other moderators may include; tree age; tree type; tree genus/species; tree location; herbivore feeding guild; simulated herbivory; time between herbivory and VOC profile measurement

"Half of science is asking the right questions" (Roger Bacon)

Do you have any thoughts or feedback you can offer on the question asked by the proposed review? Perhaps there are other important moderators that I have not considered?

What I need from YOU!

"A rose by any other name..." (Shakespeare)

The rigour of systematic review relies on finding *all* of the literature, which in turn requires finding every synonym for the search terms. The table below captures all the words I have encountered that describe the group of chemicals released by plants to the surrounding air (VOCs) There are many, many terms, and doubtless I haven't found them all - would you be willing to contribute any words or phrases that you have used or read?

"Leave no stone unturned"

(Euripides)
Do you have any unpublished data? Do you know anyone who might have? Can you suggest organisations that might have unpublished data in this area?

Why does it matter?

- Pressure exerted by 'top-down' control on herbivore populations shapes ecosystems¹
- Volatile compounds released by the plant are critical in mediating top-down control²
- Predators, sensitive to particular chemicals or chemical blends released by the plant, locate their prey by detecting these chemicals in the surrounding air³
- Plants may alter VOC production and emission under eCO₂, affecting which VOCs are released, and in what quantities⁴
- Plant volatiles can be degraded by other anthropogenic changes to atmospheric composition, such as NO_x emissions from diesel engines⁵ and increasing ground level ozone⁶
- Ascertaining which VOCs are produced by plants specifically under herbivory stress, can support more focussed research into the effects of rising CO₂ and air pollution on the top-down control of herbivory

Terms for 'suite of chemicals released by plants to the air'

Generic (including classes)		SOURCE is specific	FUNCTION is specific		Chemicals synthesised by plants - not limited to VOCs.
volatiles	Nonmethane volatile organic compounds (NMOCs)	(Fruit) volatiles	herbivore induced plant volatiles	(Inducible) volatile organic compounds	Chemical cues
plant volatiles	NMOCs	Floral volatiles	herbivore induced volatile organic compounds	(systemically) Herbivore induced volatile compounds	Defence metabolites
PVs	NMVOCs	(Botanical) volatiles	Herbivory induced plant volatiles	Airborne defense cues	
volatile organic compounds	Plant volatile metabolites	fVOCs	Host Induced Plant Volatiles	infochemicals	Defensive compounds
VOCs	Odorant (odourant)	Floral odors (odours)	HIPVs	OIPVs	Allelochemicals
Biogenic volatile compounds	Volatile chemical compounds	Floral scent(s)	HIVOCs	Oviposition-induced (plant) volatiles	Phytochemicals
VCS	Volatile Plant Compounds	Plant odorants (odourants)	Insect herbivory biogenic volatile organic compounds	semio chemicals	Plant metabolites
Biogenic hydrocarbons	VPCs	Plant odors (odours)	IHBVOCs	signaling compounds	Plant secondary metabolites
Biogenic NMOCs	Green Leaf Volatiles	Phylogenetic VOCs	Plant volatile semiochemicals	signalling compounds	Secondary metabolites
biogenic volatile organic compounds	GLVs		(Herbivore-induced) volatiles	Volatile plant cues	Plant secondary compounds
bVOC	Terpenes		(Herbivory induced) volatiles	Host plant olfactory cues	Repellants
BVOCs	Mono-terpenes Sesquiterpenes		(host plant) Kairomones (Host-plant) volatiles	Inducible plant volatiles	PSCs Attractants

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