Plant communication: Interference on the line?

Exploring the effects of elevated ozone (O_3) and diesel exhaust (No_x) on volatile organic compounds emitted as defence chemicals

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Volatile organic compounds (VOCs), low molecular weight, carbon-based compounds, are **ubiquitous** across the natural world and serve a plethora of critical functions within terrestrial ecosystems, including as a **key means of communication** between ecosystem members

VOCs are released from plants at a low level almost constantly, transmitting valuable information about a plant's physiological status. This **chemical 'whispering'** readily escalates into **'loud shouting',** with much greater levels of VOCs being released under myriad scenarios, such as when conditions are favourable for **pollination**, or when a plant experiences various **stressors**, such as **infection** or **herbivory**

VOCs emitted by plants in this way can serve as **warning signals** to neighbouring plants, who can then upregulate their own defences in readiness for impending attack. **Predators** of a feeding herbivore **can also 'hear'** very specific **VOCs** or VOC blends, enabling them to locate their prey

Reduced herbivore load through attraction of enemies (top-down control), **defence-priming** and **cross-pollination** are critical factors underpinning **plant fitness**, itself the bedrock of **ecosystem health** and **food security**

Recent work has demonstrated that **pollutants**, such as NO_x products from diesel fumes and ground level ozone (O_3), can severely **impact plant/insect relationships** (Ryalls et al., 2022)

Using the novel FADOE (free air diesel and ozone enrichment) facility at the University of Reading (pictured), ***we ask whether altered plant VOC emissions could be an underlying mechanism for these impacts?***

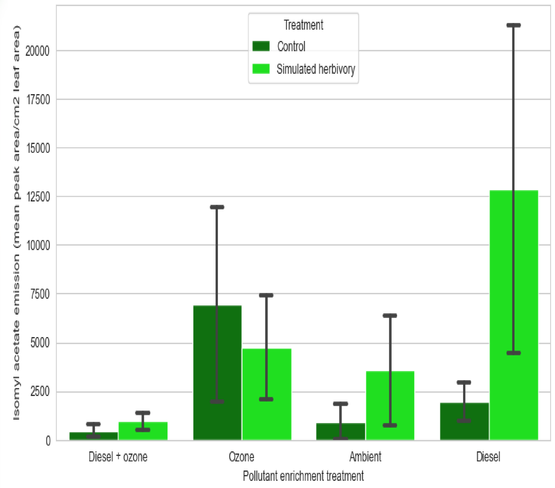
We are growing native black poplar saplings (*Populus nigra* ssp. Betulifolia) under O_3 and NO_x enriched atmospheres, whilst periodically subjecting them to simulated herbivory

Photo credit; David Casebow (2020)

Our 2022 data shows that some VOCs are being emitted differently under the different pollutant regimes

Isomyl acetate, a well-established herbivory-induced VOC in black poplar (Unsicker et al, 2015; Clavijo McCormick et al, 2014), was emitted at significantly higher levels in diesel enriched rings both constitutively (*** p<.01), and under simulated herbivory (* p<.1), than in control rings

Isomyl acetate has been shown to elicit a strong antennal response from *Glyptapanteles liparidis* (Clavijo McCormick et al, 2014), a key predator of a damaging pest, the gypsy moth (*Lymantria dispar*)



Isomyl acetate emission (mean peak area/cm² leaf area) in control and simulated herbivory exposed groups across four different pollutant regimes

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