TOWARDS FIELD DIAGNOSTICS OF OAK DECLINES: VOLATILE ANALYSIS OF OAK FOLIAGE

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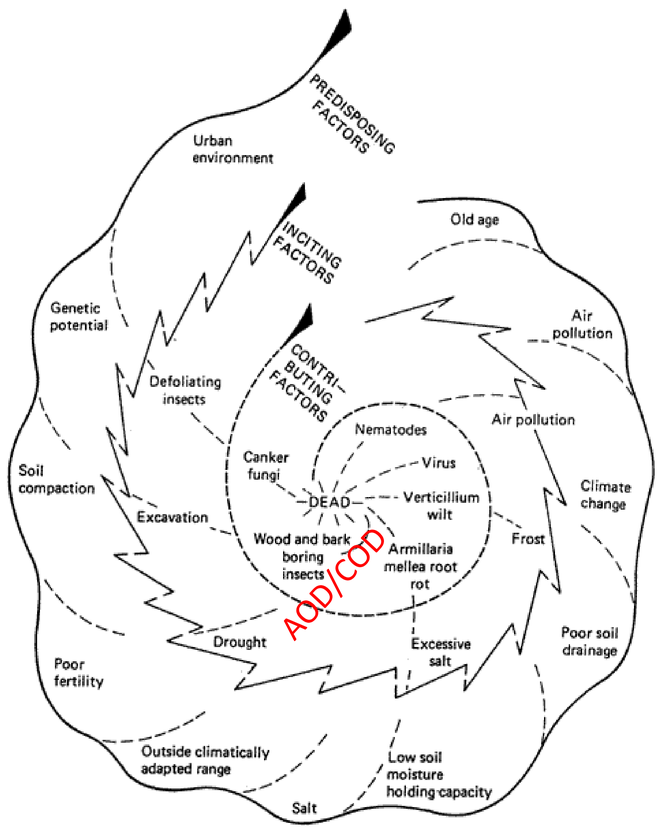
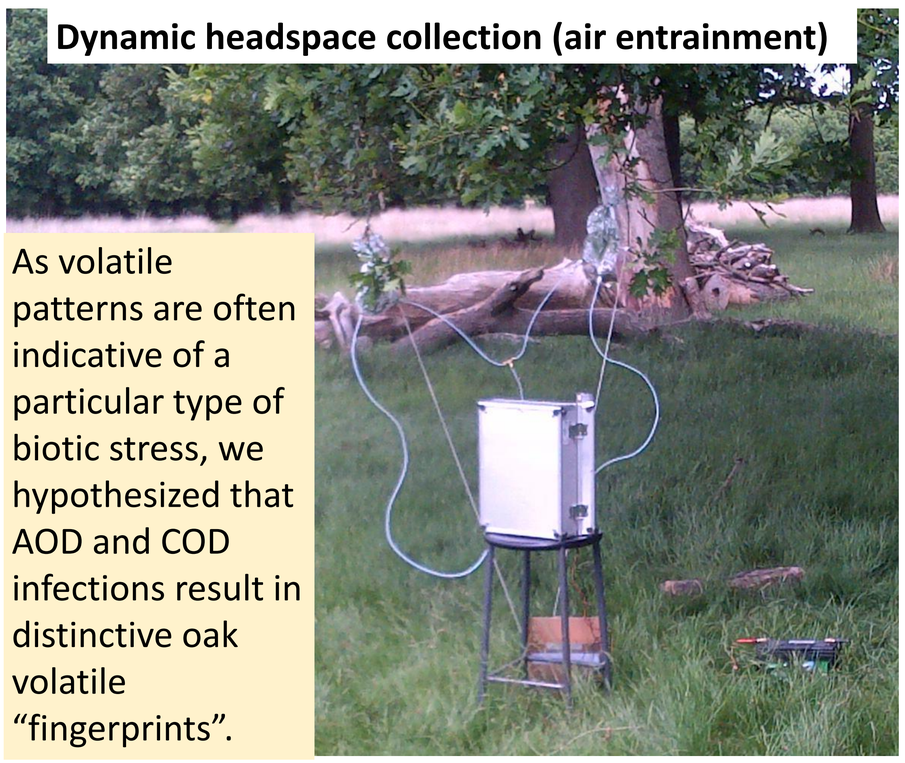
Oak declines pose a serious threat to the native UK species *Quercus robur* L. and *Q. petraea* (Matt.) Liebl.[1] In the UK, two forms of oak decline are recognised within the wider oak decline complex: acute oak decline (AOD) and chronic oak decline (COD). There has been an initiative in the UK towards robust surveillance programmes as a step towards mitigating the negative effects of pest and disease outbreaks on tree health.[2] Here, the importance of early detection of symptom development for timely implementation of preventative measures is outlined.



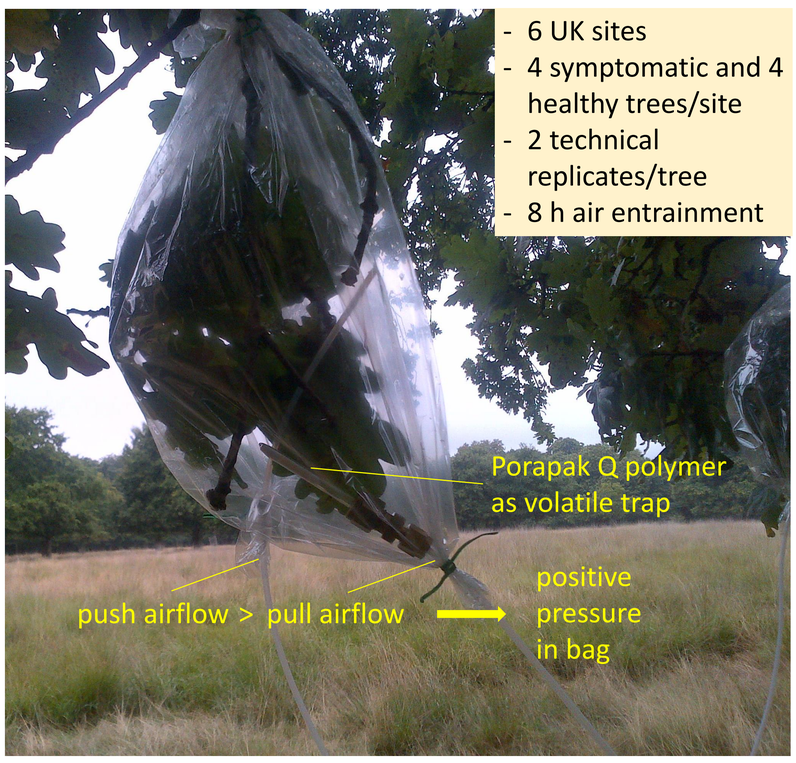
Decline disease spiral model[3]

Insects and pathogens are thought to play a critical role in the death of environmentally predisposed trees.[4,5]

Dynamic headspace collection (air entrainment)

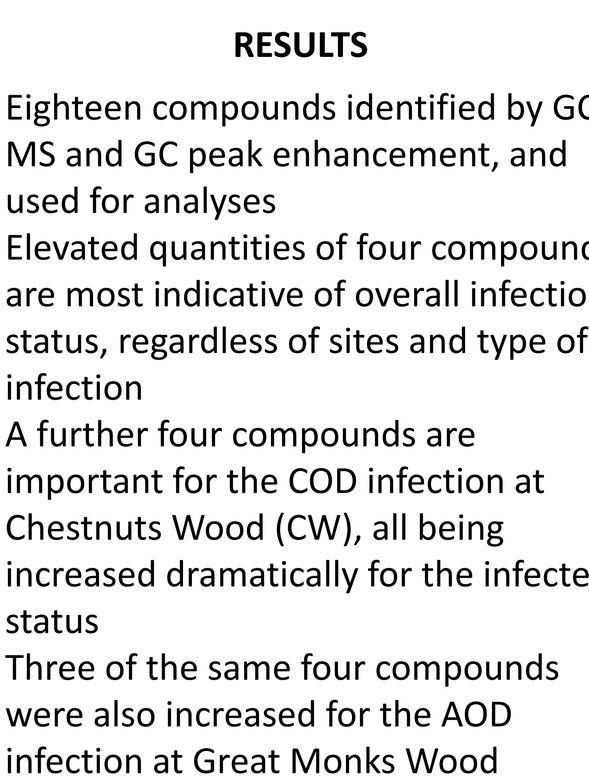


As volatile patterns are often indicative of a particular type of biotic stress, we hypothesized that AOD and COD infections result in distinctive oak volatile "fingerprints".



- 6 UK sites
- 4 symptomatic and 4 healthy trees/site
- 2 technical replicates/tree
- 8 h air entrainment

Gas chromatography (GC) and GC-mass spectrometry (GC-MS) analysis of volatile samples



GC analysis of leaf volatile samples

Multivariate analysis of GC data

RESULTS

- Eighteen compounds identified by GC-MS and GC peak enhancement, and used for analyses
- Elevated quantities of four compounds are most indicative of overall infection status, regardless of sites and type of infection
- A further four compounds are important for the COD infection at Chestnuts Wood (CW), all being increased dramatically for the infected status
- Three of the same four compounds were also increased for the AOD infection at Great Monks Wood (GMW)

[1]Denman et al. 2014, Forestry 87:551; [2]Generic contingency plan for plant and bee health in England, DEFRA PB14451, 2016; [3]Manion and Lachance 1992, Forest decline concepts, APS Press, 249 p; [4]Brown et al. 2016, Forest Ecol Manag 360:97; [5]Brown et al. 2017, Forests 8:87

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