(Invasive) alien vertebrates

Chemical susceptibility of trees to grey squirrel (*Sciurus carolinensis*) bark-stripping damage

Ash, Alexandra K.[1,4*]; Pickett, John[2]; Spake, Rebecca[3]; Kandil, Sahar[2]; Roche, Elizabeth[2]; Gill, Robin M.A.[4]; Nichols, Christopher P.[5]; Dutton, Charles[6]; Doncaster, Patrick C.[1]

[1] University of Southampton, Faculty of Environmental and Life Sciences, School of Biological Sciences, Southampton, UK
[2] Cardiff University, School of Chemistry, Cardiff, UK
[3] University of Southampton, Faculty of Environmental and Life Sciences, School of Geography and Environmental Science, Southampton, UK
[4] Forest Research, Centre for Forest Protection, Alice Holt Lodge, Farnham, Surrey, UK
[5] Woodland Trust, Kempton Way, Grantham, Lincolnshire, UK
[6] Charles Dutton & Co (Dorset) Ltd, Dorset, UK
* A.K.Ash@soton.ac.uk

DOI: 10.20315/evmc.2025.151

Invasive grey squirrels (*Sciurus carolinensis*) in Britain peel the outer bark from broadleaf trees to access the underlying phloem tissue layer, reducing timber potentials and biodiversity. Trees are highly variable in their susceptibility to squirrel damage, and while previous research has identified characteristics that relate to susceptibility in broadleaf trees, the underlying causes for variation in tree susceptibility is unknown. Plant chemistry is known to influence mammalian herbivory and foraging decisions through smell and taste. However, there are no investigations that have identified chemical factors contributing to the susceptibility or resistance of trees to squirrel damage.

To investigate the potential for tree chemistry to influence susceptibility, we identified and described the volatile organic compounds (VOCs) from the fresh foliage of ten broadleaf clones varying in their susceptibility to grey squirrel damage. VOCs were collected from the foliage via dynamic headspace sampling and were identified by gas chromatography mass spectrometry (GC-MS). Chemical compounds that varied qualitatively with clone type were identified using multivariate generalised linear models (*manyglm*). The compounds identified also varied quantitatively with clone type, where quantitative differences were visualised with physical characteristics using a self-organising map (SOM) and Sankey diagram. We then explored the effects of the main identified VOCs from two clones varying in susceptibility to squirrel damage on squirrel behaviour in three Hampshire woodlands. We hypothesized differences in behavioural responses between VOCs identified from trees highly susceptible and least susceptible to squirrel damage to a mineral oil control. Generalised linear mixed effects models (GLMM) were used to model behavioural differences as a function of various VOCs with treatment and time as fixed effects, and site and feeding hopper as random factors. Squirrel behavioural responses varied with treatment, and key behavioural responses such as the time squirrels spent accessing hopper bait was significantly reduced in the presence of VOCs identified from least susceptible clones. Differences in behavioural responses to various VOCs may explain the susceptibility of trees to damage and mediate the interactions between squirrels and trees in the context of their bark-stripping behaviour.