

Decoding nestmate recognition signals in ants

Sue Shemilt¹, Falko Drijfhout¹ & Stephen Martin²

1. Chemical Ecology group, Keele University, Staffordshire

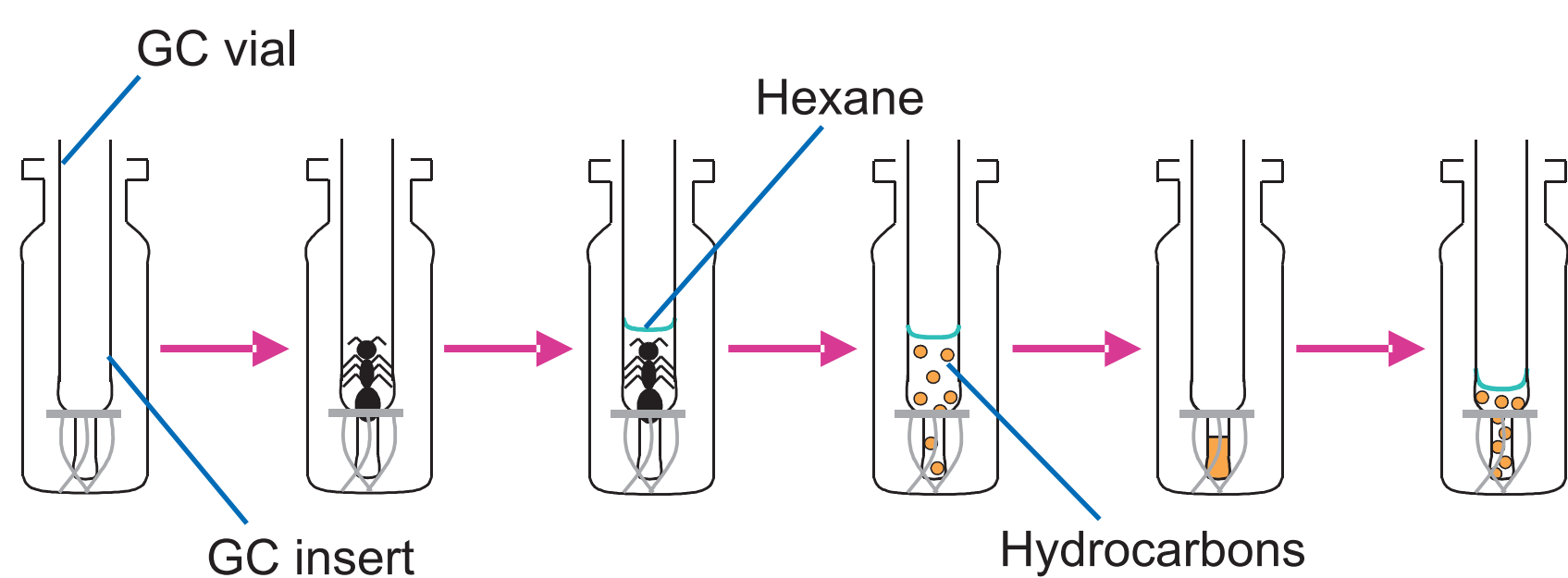
2. Laboratory of Apiculture and Social Insects, University of Sheffield, Sheffield

Introduction

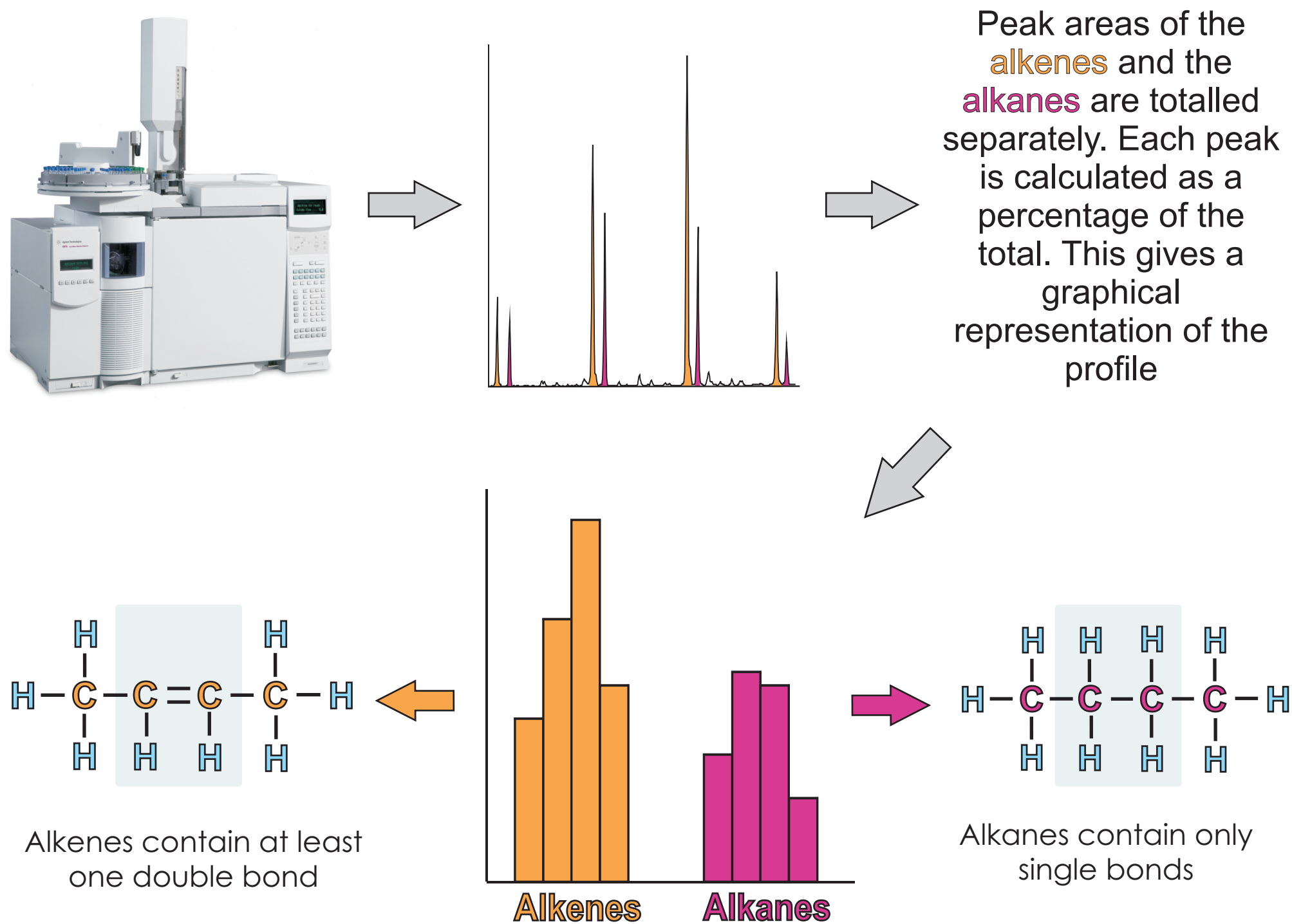
Ants are one of the most highly developed social insect species, regularly feeding and grooming each other. However, for these behaviours to benefit only colony members, a sophisticated recognition system must exist. Like all ants, our studied species *Formica exsecta*, a type of wood ant, uses a blend of long chain hydrocarbons on the surface of the ant, known as the cuticle, to act as a unique colony signature. This enables an individual to recognise friend or foe. This chemical profile can be easily analysed using gas chromatography coupled to mass spectrometry, providing a way of visually comparing the profiles present.

Method

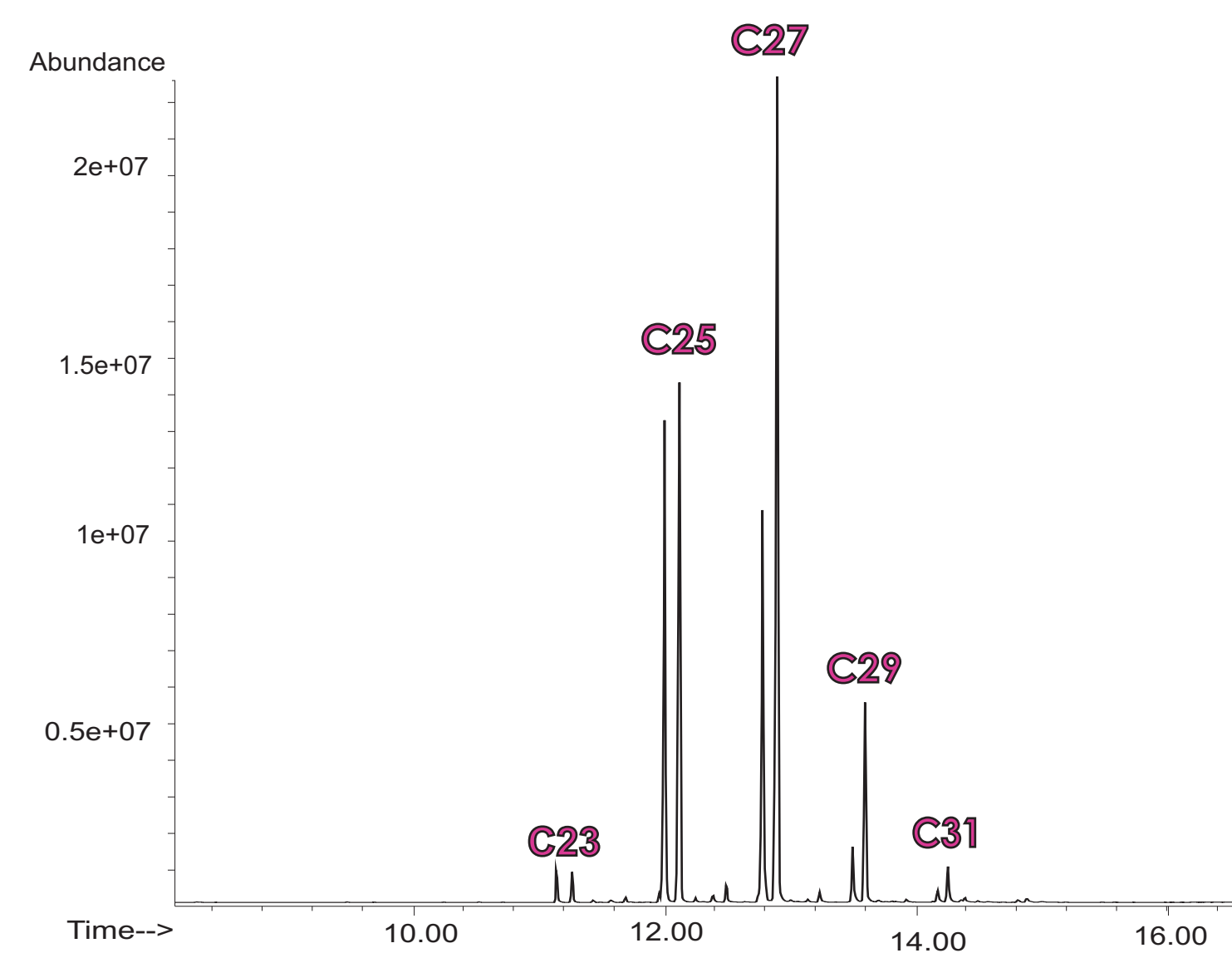
- The cuticular hydrocarbons are extracted:



- Sample is injected into the GC-MS and a chromatogram obtained

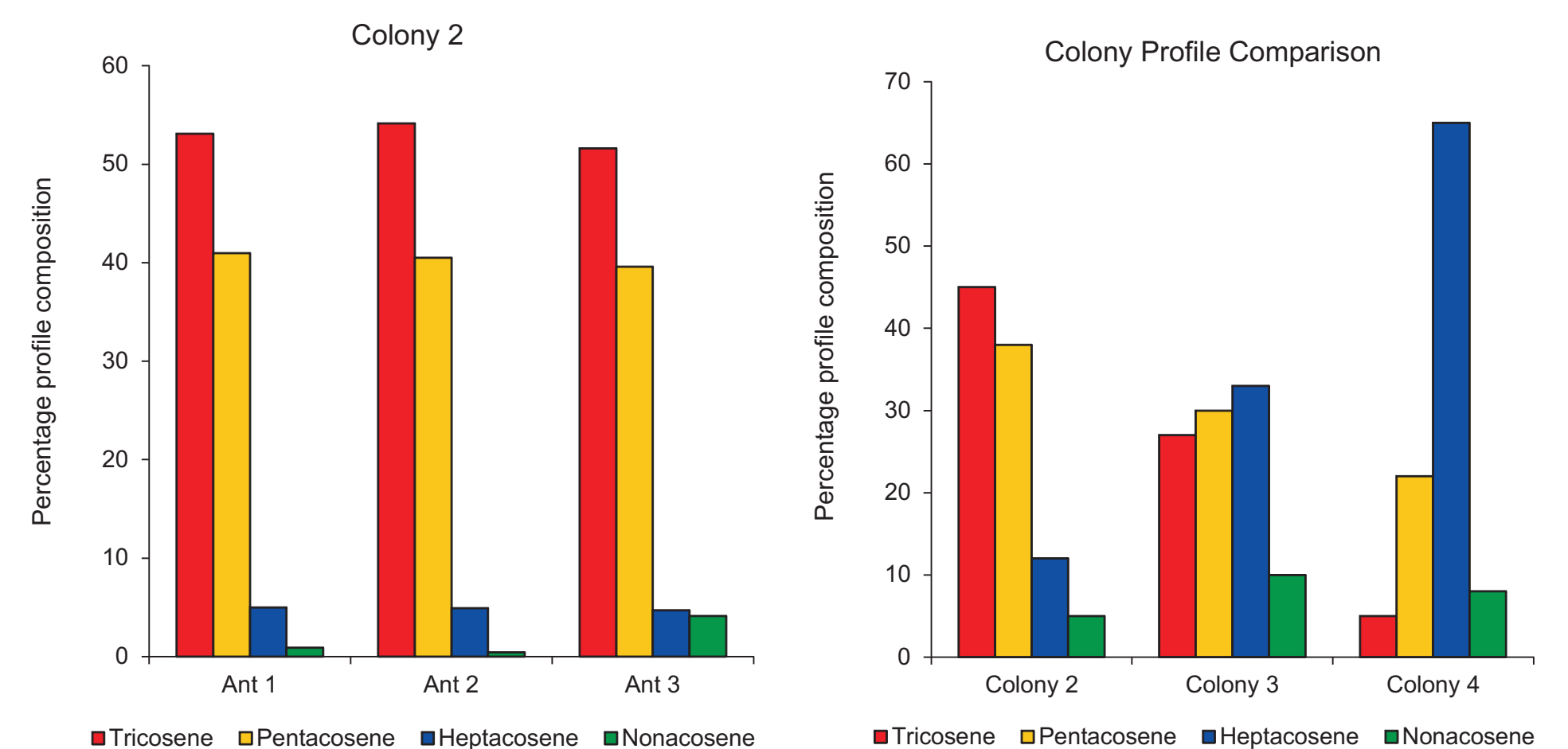


Results



An example chromatogram showing the compounds present in the cuticular hydrocarbon profile and their ratios. Each pair of peaks consists of an alkene followed by an alkane. The length of the carbon chain is indicated

Chromatograms are processed to produce percentage compositions. These are compared to others to determine the profile similarity



The chemical profile indicates these ants are nestmates; therefore they show mutually beneficial behaviour. These ants are feeding each other



The chemical profile indicates these ants are not nestmates; they show aggressive behaviour. These ants are both posturing defensively and preparing to fight

Summary

- Every ant possesses a colony specific chemical signature, made up of various long chain hydrocarbons
- This is secreted onto the ants bodies both as waterproofing and to produce an individuals 'profile'
- This 'profile' is the same between colony members but varies between colonies
- Other ants can read this signature, allowing them to distinguish between nestmates and non nestmates and behave appropriately
- The profile is analysed using gas chromatography mass spectrometry, and a graphical representation can be produced to allow individual profiles to be easily compared