

Introduction

- Plant wax compounds (e.g. long-chain hydrocarbons, fatty alcohols and fatty acids) differ according to plant species
- Plant wax compounds are long-lived in soil and reflect the present and past vegetation and applied organic fertilisers
- The composition of wax biomarkers in soil offers a new approach to soil characterisation of forensic samples
- Forensic samples weighing only a few milligrams e.g. a scraping from a shoe, may need to be compared to a particular garden or site.
- This project aims to modify the existing methodology (Dawson et al., 2004) to allow small samples to be analysed

Tests of methodology

1. Reduction of contamination

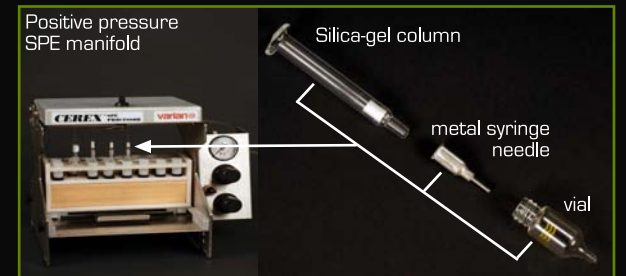
- Use redistilled solvents at optimal volumes
- Avoid contact with plastics (other than PTFE)
- Heat glassware to 450°C prior to use
- Wash solid reagents with solvent (KOH and silica-gel)

2. Miniaturisation

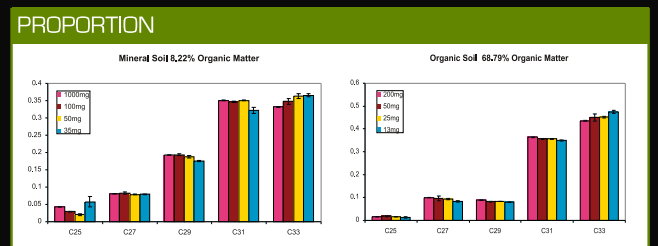
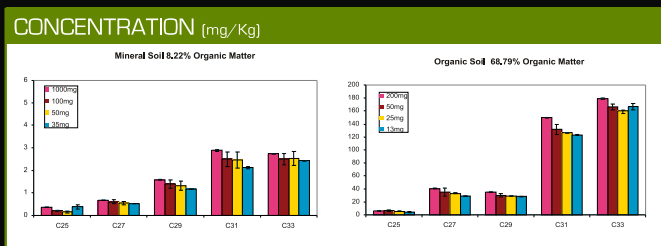
- Different sample weights of a mineral soil and an organic soil (dried and ball milled) analysed for plant wax markers
- Weights analysed:
 - Mineral soil – conventional weight 1000mg; reduced weight 100mg, 50mg and 35mg
 - Organic soil – conventional weight 200mg; reduced weight 50mg, 25mg and 13mg
- Amounts of solvents and other reagents, and size of equipment (vials and chromatography columns) reduced as sample size reduced
- Positive pressure solid phase extraction (SPE) manifold used for extract clean-up with glass silica-gel columns
- For reduced weight samples, extracts were manually injected on the gas chromatograph

Conventional analysis

Analysis with measures to reduce contamination



Results



- Estimates of alkane concentrations were generally consistent across different weights analysed for both soils
- Patterns of alkanes were consistent across different weights of samples analysed

Conclusions

- Analyses of soil alkanes were satisfactory for sample sizes as little as 35mg for mineral soil and 13mg for organic soil
- Further investigations are underway to ascertain the reason for slight inconsistency in concentration estimates with sample weight
- There is potential for further reductions in minimal acceptable sample size
- Similar studies are underway for analysis of long-chain fatty alcohols and fatty acids in small soil samples
- This work suggests that soil wax biomarkers can be used as a forensic tool when only small samples of soil are available

