

ABSTRACT

High Pressure Liquid Chromatography Mass Spectrometry (HPLC MS) is a powerful method for characterising fats and oils at the molecular level (triacylglycerols) and has wide application in food science. This method has great potential for the analysis of archaeological food residues but has yet to be systematically evaluated. The purpose of this study is to evaluate the technique for the characterisation of archaeological food residues.

The study compares three classes of food residue. The first is a reference group of modern plant and animal fats and oils selected chosen after a literature review of botanical and faunal remains from archaeological sites in Anatolia. The second is the residues from the same foods after cooking. Finally, archaeological samples from Late Bronze (LBA) and Early Iron Age (EIA) ceramics (1500-900 BCE) from the site of Gordion in Central Anatolia.

The modern foods were used as a baseline to establish the characteristic fatty acids and triacylglycerols associated with each food type. The experimental dataset was used to assess the extent of lipid alteration through cooking, and the potential influence of ceramic lipid interactions on lipid recoveries. The archaeological ceramics were used to determine firstly if analytically viable recoveries of lipids could be made from 3000 year old earthenwares. Comparison of these three datasets allows the archaeological residues to be matched with known food types. It also allows the evaluation of the effects of degradation through experimental cooking and post depositional alteration. Despite the reduction of lipid species recovered in the experimental cooking and archaeological residues, comparison of the three datasets

showed it was possible to distinguish plant from animal residues in the archaeological extracts.

The study makes two substantive contributions. First, it shows that analytically viable residues are preserved in archaeological ceramics from a temperate archaeological environment. Second, the results for the case study corroborate other lines of archaeological evidence regarding the shifts from the LBA to EIA in Central Anatolia. A methodological innovation is the adoption of a multivariate approach (PCA) for the interpretation of lipids. This offers significant advantages over other published techniques of archaeological residue characterisation.

The primary limitation encountered in this study was sample throughput highlighting the need for more efficient preparation and analytic protocols. I address these limitations by flagging modifications which would significantly enhance sample throughput.

When used in tandem with more conventional techniques (GC MS) HPLC MS provides a new and more comprehensive approach to the characterisation of archaeological fats and oils.