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individual materials for forensic, art and archaeological studies.

[1] *Glaus R et al, 2012; 84, 5358-5364. 2. Koornneef et al, 2015; Chem Geol, 397, 14–23.*

THE WHAT, WHERE AND HOW OF MEASUREMENT UNCERTAINTY FOR IRMS DELTA VALUES

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With all measurement techniques there is a degree of uncertainty in the results obtained. This measurement uncertainty reflects a range of values within which can be found the true value for the measured result. Correct estimation of the measurement uncertainty allows the reliability of a result to be assessed as well as comparison of different results with each other or with thresholds/limits. For forensic applications of analytical techniques such as isotope ratio mass spectrometry (IRMS), the correct estimation of the measurement uncertainty is critical for correct interpretation of the obtained data.

For IRMS-derived delta values there can be many different factors which contribute to the overall measurement uncertainty. The paper will highlight what these factors are, where they arise and how they can be avoided or accounted for. This will include a discussion over the effect on the measurement uncertainty of various corrections that are commonly applied to raw instrumental data. Examples of different approaches to uncertainty estimation taken from an inter-laboratory comparison on bulk honey carbon isotope ratio measurements will be presented and compared.

STABLE ISOTOPE ANALYSIS OF AMINO ACIDS: A NEW TOOL FOR FOOD AUTHENTICATION

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Stable isotope ratios have been used for thirty years for food authentication and in the last few years emerging methods aimed at individual chemical compounds have provided a means of obtaining a more in-depth understanding. Here, in particular, the feasibility of using compound-specific nitrogen and carbon isotope analysis of plant-derived amino acids was investigated in two different studies.

Initially, δ15N and δ13C determination of amino acids was used to discriminate between conventional and organic wheat grown using synthetic nitrogen fertilizers, animal manure, or green manure from nitrogen-fixing legumes. After protein hydrolysis and derivatization, determination of amino acid δ15N and δ13C values was carried out by gas chromatography combustion isotope ratio mass spectrometry (GC-C-IRMS). The results demonstrated that δ13C of glutamic acid and glutamine in particular, but also the combination of δ15N and δ13C of 10 amino acids, can significantly improve the discrimination between conventional and organic wheat, as compared to stable isotope analysis of bulk tissue.

Subsequently, the variability of δ15N values along the wine production chain in different vineyards and the influence of the fermentation process (e.g. different yeasts, white and red vinification, etc.) were investigated for the first time. Furthermore, compound-specific δ15N analysis of proline, extracted using a resin from grape juice and wine, was performed by GC-C-IRMS for the first time. Despite nitrogen isotope fractionation along the oenological chain, the δ15N values of leaves, grapes, wine and proline reflected the nitrogen isotopic signature of the soil. In particular, proline values in both grape must and wine were very similar to the δ15N values of the soil used for plant growth. It was thereby demonstrated that δ15N could be used as an additional and new isotopic marker to trace the geographical origin of wine.