Geophysical Research Abstracts
Vol. 15, EGU2013-9025, 2013
EGU General Assembly 2013

Developing Potential New Reference Materials for Light Isotopes in Foodstuffs

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Measurements of subtle variations in stable isotope ratios provide the means for verifying food integrity in numerous ways. Adulterants usually have different isotopic composition so their presence in a food is readily detectable. Stable isotope measurements can also be used to determine the region of production of the food. In most cases the ability of stable isotope measurements to verify, or otherwise reject, the authenticity of the food is greatly enhanced by comparison of a result to a reference database. The more high-quality data in the database, the more statistical power is afforded by the comparison. A serious weakness at present is the lack of reference materials in food matrices available to the community. Thus researchers have to rely on in-house standards for calibration and quality assurance. The result is that there are numerous datasets published that may be internally consistent but it is exceedingly difficult to combine these datasets into a cohesive database. This is particularly important for measurements of the hydrogen isotopes.

Here we present a survey of the stable isotope ([U+F064]2H, [U+F064]13C and [U+F064]15N) composition of 12 Reference Materials from the International Atomic Energy Agency catalogue. All but one of these materials are plant matter and have been developed as reference materials for other applications such as radionuclide or trace element measurements. Thus they have been verified as suitable materials in terms of stability and homogeneity for those tests. The purpose of this work is to ascertain if they are similarly suitable as stable isotope reference materials.

The results from our survey show that there is a wide range in elemental and isotopic composition among these materials. For example, the [U+F064]15N values range from-13.5‰ to +18.6‰ and the nitrogen elemental composition range is from 0.7% to 9.7%. The [U+F064]13C values range from -20‰ to -40‰ and the carbon elemental composition ranges from 15% to 47%. We are now in the process of selecting candidates from these for further homogeneity and stability tests before certification.