**Analytical methods comparison for stable carbon isotope ratio determination in food and environmental samples**

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The existence of stable non-radioactive isotopes of the elements and measurement of these isotopes were first recognized in the early 1920s. Some of these isotopes are radioactive and decay to others compounds, while others do not and are denoted stable (12C,13C). A number of stable isotopes have been found to be useful in human investigations since they are non-radioactive and can be used without risk.

In the last few years attention has been focused on carbon isotope fractionation during photosynthesis. In fact, plants can be divided in to three types with different carbon isotope fractionation patterns as a result of atmospheric carbon dioxide-fixing reactions: C3, C4 and CAM pathways. The C3 plants use the Calvin cycle for carbon dioxide fixation and their isotope composition is into the range -22 to -34‰. The C4 plants, like tropical grasses sedge maize and sugar cane, use the Hatch-Stack cycle and their isotope composition is into -6 to -23‰. The CAM plants (Crassulacean acid metabolism) have isotopic range between -11 and -33‰. The stable carbon isotopic data are expressed in delta as the per mill deviations of the isotope ratio of a sample relative to standard (Peedee belemite limestone PDB)

δ13C= [(Rsample- Rstandard)/Rstandard] x 103

where R= 13C/12C.

In recent years, the 13C/12C carbon isotope ratio has been a chemical parameter with many important applications in several scientific areas. For examples, it is a useful tool in environmental science (Proto 2014), in archeology for paleodietary reconstruction (Caputo 2012), in geochemistry for volcanic activity, in medicine for noninvasive test of Helicobacter pyroli infection (Motta 2009) and nutrition-related research.

In general the isotopic ratio is carried out analyzing carbon dioxide obtained by converting the carbon of the sample. The first technique to be used for highly accurance determinations has been the Isotopic ratio mass spectrometry (IRMS). Afterwards,several methods for isotopic analysis have been reported as LARA (laser-assisted ratio analyzer), OGE (optogalvanic effect), NDIRS (non-dispersive infrared spectroscopy) and traditional IR. In such scenario, great interest is based on the development of new analytical methodologies, accurate and inexpensive, in order to increase the choice of the analyst. In this work, is reported a preliminary study of comparison of three different methods (IRMS, NDIRS and IR) for the determination of the carbon isotope ratio in food and environmental samples, evaluating their accuracy.

Results obtained shows that the isotopic values can be also detected with the same accuracy compared to IRMS. The principal advantage of this work is that NDIRS and IR are cheaper and more common than IRMS.

Reference.

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