



Determination of fruit juice origin by using multi-element stable isotopes

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Besides several new applications like e.g. for forensic or archeometric problems multi-element stable isotope analysis has been mainly used for food authenticity control during the last years. For this purpose stable isotopes of the light (“bio-“) elements (H, C, N, O and S) in combination with Sr are used. Whereas the light elements provide information about climate, distance to the sea, altitude, latitude and agricultural conditions, Sr, which originally is used in geosciences for geochemical and geochronological purpose, bears information about the regional pedo- and lithological situation.

In this study (“Pure Juice”, funded by the European Union), methods to determine the provenance and adulterations (like e.g. adding of water, sugar or concentrate) of fruit juices were developed.

For analyses of the light elements’ isotopes sugar-, acid- and pulp fractions of the juices were prepared. The measurements were carried out on an elemental analyzer coupled with an IRMS (Isotope Ratio Mass Spectrometre).

For Sr-isotope investigations the bulk juice, soluble and insoluble fraction (pulp) were used. The measurements were carried out on a TIMS (Thermal Ionisation Mass Spectrometre).

In the course of the project several hundred authentic juice samples (orange, apple and pineapple) from all over the world have been investigated. Multi-element isotope patterns have been developed for many different regions (samples from each continent

have been investigated) and are applied successfully in routine analysis of commercial products.

In addition to stable isotope investigations of the light elements Sr turned out to be a quite valuable tool to recognize and distinguish different origins due to the very homogenous geological conditions of many sample areas (e.g. the discrimination between orange juices from Spain and countries of Middle or South America is a frequent problem in practice). Sr isotopes are also a very useful tool to detect the undeclared adding of concentrate to a single strength juice by separately analysing of liquids and pulp of a suspect sample.

Provenance determination of fruit juices is applied to control products with labelled geographical provenances, for customs purpose and for self control in industry.