



Using rare earth elements for the identification of the geographic origin of food

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The European Union defined regimes within the Protected Geographical Status (PGS) framework to protect names of regional food specialities. Thus only food produced in a specific geographical area with a specific way of production or quality can be protected by a protected geographical indication (PGI) label. As such Styrian Pumpkin Seed Oil has been approved with this label, but as with many other high priced regional specialities, fraud cannot be excluded or nor identified. Thus the aim of this work is, to develop an analytical method for the control of the geographic origin of pumpkin seed oil and also to test the method for other protected products. The development of such a method is not only of interest for scientists, but also of importance for the consumer wanting to know the origin of the food products and the assurance of the purity and quality.

The group of rare earth elements (REE) in plants also have a characteristic distribution pattern similar to upper crustal REE distributions. Since the REE concentrations are extremely low in pumpkin seed oil (ppt to low ppb), ICP-MS was the only sensitive tool able to produce validated results. The carrier of the REE are most likely small particles distributed within the pumpkin seed oil. Unlike, e.g., olive oil, pumpkin seed oil is bottled and sold unfiltered, which makes this Styrian speciality an interesting sampling target. As pumpkin seed oils from different geographic origin show variable trace element and rare earth distribution patterns, it should be possible to trace the origin of these oils.

In the current project pumpkin seeds from different regions in Austria and from abroad were sampled. The trace element patterns in the extracted oil of these seeds were determined and a preliminary classification with discriminant analysis was successfully done on a statistical basis.

In addition to the study of the geographic origin it was demonstrated that REE distribution patterns can also be used for the identification of adulteration of high priced pumpkin seed oil with cheap neutral tasting refined oils. Interestingly enough, the variations of the REE patterns between oils from different regions are much more pronounced than their host soils. Thus we assume that microbiological processes in the rhizosphere are in control of the REE uptake into the plant. Regional variations of the microbiological composition of the soils and probably not only a priori the bulk soil composition of the minerals in the soil are the cause of the regional variations making it possible to identify the geographic origin of pumpkin seeds and as a consequence the pumpkin seed oil.