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Preliminary studies of geochemical tools to traceability of Sicilian honey

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Introduction

Today is increasing the attention of consumers for the origin of food and high reputation of products with a distinct geographical identity. Traceability of the food origin is important for label protection. So, establish systems to trace food or feed products through specified stages of production, processing and distribution play a key role also to ensure food safety. Despite, the honey is a well appreciated natural product in the world and the detection of potential fraud could be favored through tools linking the chemistry composition of this production to producing area. A relatively small number of investigations regarding traceability of honey can be found in the scientific literature. Recent works have been demonstrated the potentiality of lanthanides as geographical markers due their coherent and predictable chemical behavior. So, the study of the distribution pattern of these compounds seems to be a promising system to establish univocal traceability systems.

Objectives

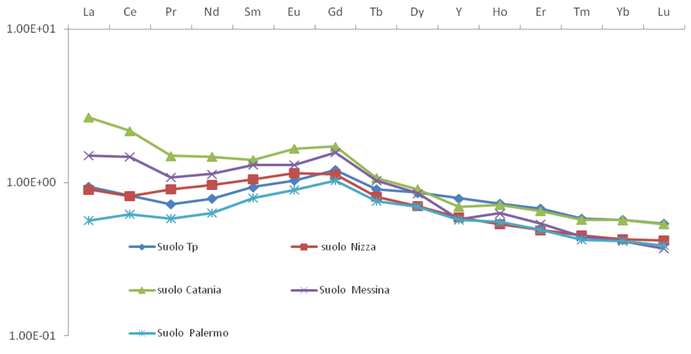
The aim of the research is to observe if the REEs normalized pattern of honey samples is kept unaltered respect the soils of production to establish a correlation between geographic area and honey product. This study will focus on different kind of honey collected in four different areas of Sicily: Petrosino (Tp), Vicari(Pa), Acireale(Ct), San Fratello (Me) . The specific objective was to find a response in the (normalized) pattern of rare earths in soil and in honey samples taken as a function of different lithologies (or geographic origin).
First results were reported and discussed

Materials and Methods

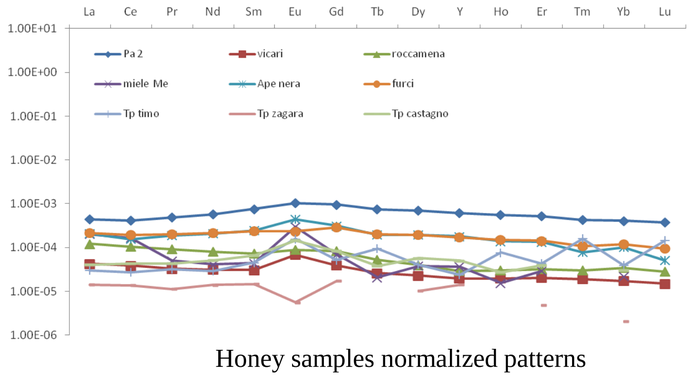
Aliquots of 2 g of honey samples were digested with 3 ml of ultrapure HNO_3 (65%v/v) and two time with 2 ml of ultrapure H_2O_2 in a PFA vessel in a microwave systems. Soil samples were dried in oven at 105°C, crashed, sieved and homogenized. Aliquots of 0.500g were digested with 3 mL of ultrapure HNO_3 (65%v/v) and 2 ml of ultrapure H_2O_2 in a PFA vessel in a microwave systems. An ICP-MS instrument (Agilent Technologies 7500cx Series Spectrometer) was used and all instrumental parameters were optimized for the analyses of all the investigated trace elements. ICP-MS analyses were carried out with a external calibration approach, from 1ng/L to 100 µg/L and 187Re (1000 ng/mL) as internal standard. The isotopes used to quantification were as follows: ^{139}La, ^{140}Ce, ^{141}Pr, ^{146}Nd, ^{147}Sm, ^{151}Eu, ^{158}Gd, ^{159}Tb ^{163}Dy, ^{89}Y, ^{165}Ho, ^{167}Er, ^{169}Tm

Results

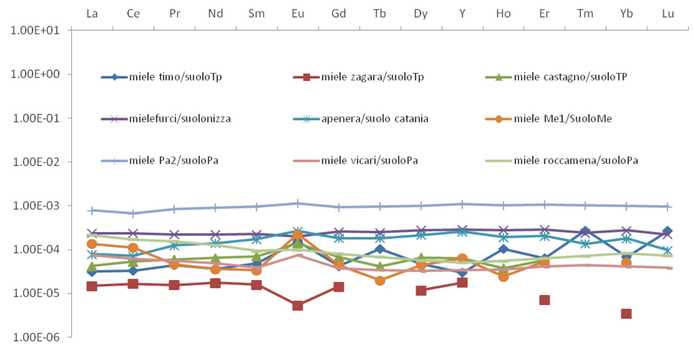
In our studies the YLOID amounts and the pattern of YLOID were calculated. The data have been normalized respect Upper Continental Crust (UCC) as reference, then ratios are plotted on a logarithmic scale against the atomic number show the distribution pattern of soils and honey samples.
The obtained results demonstrate that also the honey samples belonging to on the soil with similar YLOID pattern, have the similar YLOID one. Hence, the YLOID patterns could be a versatile tool to link soil and grape, for a geographical characterization.



Soils normalized patterns



Honey samples normalized patterns



Honey/soil normalized patterns

In order to recognize whether a relationship exists between YLOID contents in honey and amount determined on soil, it is useful to normalize the grape YLOID pattern in respect of the own soil. This normalization highlights the behavior of YLOID in the honey/soil system. Obtained systems have shown (in graphs above) a coherent YLOID distribution along the data series and it is possible to notice that the distribution honey patterns normalized with the soil of each geographic site, discriminate deeper the different honey samples.

Conclusion

In this first study the YLOID approach, give very intriguing results in the geographical traceability of honey samples. The results have been supported by statistical treatment. A larger study is in progress to optimize the analytical methodology and to extend the research to a major number of sample for a better geographical characterization.