

Extended Abstract

The international scientific community in recent years, has paid great attention to the development of innovative and suitable methodologies for solving the problem of traceability in the food industry.

The first oenological study that took into account the Sr isotope ratio values as a geography tracer were published in the early 90s by Horn et al. (1993). The authors have shown that there is a relationship between the values of the isotopic ratio $^{87}\text{Sr}/^{86}\text{Sr}$ of wines and the different region of wine provenance providing encouraging results for the use of $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratio for geographical traceability of wines.



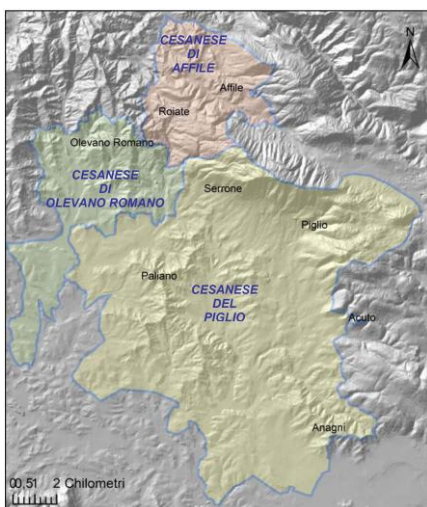
In the following years, scientific research has focused primarily on the methodological and in particular on the experimental verification of the assumption that the values of the $^{87}\text{Sr}/^{86}\text{Sr}$ isotope ratio of the wines were not changed during the winemaking process (Almeida & Vasconcelos, 2001). Therefore, any portion of the territory where it lodges a vineyard has a specific isotopic ratio $^{87}\text{Sr}/^{86}\text{Sr}$ which may represent a fingerprint of wine compared to its geographical origin. However pioneeristic studies were of foremost importance for indicating the way to follow, but they fail to provide an analytical method with uncertainties as low as those typical of geological studies.

In this work we have tried to develop a new analytical procedure to determine the $^{87}\text{Sr}/^{86}\text{Sr}$ ratio in the products of the food chain, from the soils that form the substrate of the vineyards to wine as a finished product by way of grapes and wine. The new analytical protocol shows good reproducibility, comparable with that of the rocks in geological systems, to enable assessment of the possible link between geological substratum of the vineyards and wine production (Marchionni et al., 2013). The actual experimental work has developed through three main phases of action.



The first phase tested the eventual consistency of the initial hypothesis , that there was a relationship between wine and geographical area of origin by analyzing bottled wines with certification of origin (IGT , DOC , DOCG) acquired by the dealer focusing on four regions Italian : Tuscany , Lazio, Campania and Basilicata. For these four regions experimentation has

focused on single cultivar wines from wine-sector consortia of which the geological literature presents a thorough knowledge of the isotopic distribution of Sr in the rocks of their substrate. Experimental work has shown good correlation between Sr isotopes of wines and those of the substrate sets the vineyard. We also observed in a preliminary way as for white wines have values that differ from those of the substrate very likely due to the addition of additives, such as bentonite. The experiment showed that the isotope ratio of Sr is preserved in time, that you do not have Sr fractionation during the process of winemaking and organic wines from vineyards that set on the same substrate have the same ratio and $^{87}\text{Sr}/^{86}\text{Sr}$ then this ratio can be used as a tracer geographical wine (Marchionni et al. , 2013).



The second phase focused on a specific experiment on the only area of the Cesanese including consortia of Cesanese of Affile, the Cesanese Olevano and Cesanese Piglio. As far as this part of the study area Lazio had the chance to analyze also grapes, grape must, soils and substrates in addition to the wines of different vintages. In this phase have been selected 6 wineries which have supplied grapes, musts and wines of different vintages , and allowed the sampling of both

the rocks of the substrate soil. These companies provide control over the origin of wines from well-defined areas, culture and the ways single variety of wine making. For each

company have been identified one or two portions of land planted with vines of limited size (from one to four acres), characterized by a lithologically homogeneous substrate, where they are planted red grape varieties. The experiment has shown that the isotope ratio of Sr remains unchanged during the winemaking process, preserving the isotopic ratios typical of the substrate. Contrary to what is observed by Marchionni et al., (2013), also because of the greater detail of this experimental study, it appears that the isotopic ratio to keep in mind as comparison value for the validation of the geographical origin of wines that of the leached soil, rather than those of the soil analyzed in its total component or one of the rocks of the geological substrate, though in a first approximation, these are very close to the Sr isotopic value of the wines.



The third phase of the experiment was developed in collaboration with researchers at the institution CRA and developed with the support of the winery “Barone Ricasoli SpA”. The trial took place in company where the urban noises were sampled on rows of vines defined soil substrate and three different vintages and grape sap. In relation to the proposed objectives is to be noted that the strengths with which the project was conceived are

substantially related to the use of a technique of micro-vinification in the laboratory of the individual samples of grapes picked, which allows a tight control on progress in preparation and to the knowledge of the detail of the sampling point which allows to have a good completeness of the information boundary. For each vintage were made micro vinification for each row of vines. The Sr isotope data showed a constancy in time of micro vinification to spin, and an unbreakable bond between Sr isotopes of the finished product and those of the extractable fraction of soil even at a local scale. From this study we can conclude that it is possible to discriminate between wines sampled regularly set on different soils, assigning to each a $^{87}\text{Sr}/^{86}\text{Sr}$ ratio characteristic, the process of transfer of Sr from the roots to the wine, the final product does not depend on time, the observed variability is due to the heterogeneity of the soil - geological substrate sets the vineyards and the presence of bioavailable Sr in soil is also influenced by fertilizers and pesticides.

In general we can conclude that the $^{87}\text{Sr}/^{86}\text{Sr}$ ratio may represent a significant parameter and a good tracer geological analysis of wines.