Geophysical Research Abstracts
Vol. 16, EGU2014-7755, 2014
EGU General Assembly 2014

Determination of wine authenticity and geographical origin by measuring non-exchangeable hydrogen stable isotopes in wine ethanol with EIM-IRMS® methodology in combination with δ18O values obtained from wine water.

Ivan Smajlovic (1), Mirko Glavanovic (1), Kimberlee L. Sparks (2), Jed P.Sparks (2), and Slobodan Jovic (3)

(1) SG Isotech LLC, 1529 Oakwood Ave, Des Plaines, IL 60016, USA, (2) COIL (Cornell University, Stable Isotope Laboratory), Corson Hall E149, Ithaca, NY 14853, USA, (3) Department for Fermentation Technologies, Faculty of Agriculture, Belgrade University, Nemanjina 6, 11080 Belgrade, Zemun, Republic of Serbia

Wine consumption has grown significantly in the last two decades, with the United States being the leading consumer of wine in the world. It is also the second largest wine producer and importer after the European Union, which consists of 27 European countries. The world has seen a significant increase in production from new world countries, especially the United States, Australia and Chile, and wine imports have grown significantly with this globalization. The quality and authenticity of products have become critical concerns. With the amount of wine being imported the need for verifying wine authenticity and understanding procedures used in wine making has become more important than ever. Understanding the origin of consumed wine in rapidly expanding global economy has become fundamental in order to control quality and protect consumers.

In our previous scientific work we have shown that EIM-IRMS®, Ethanol Isotope Measurement - Isotope Ratio Mass Spectrometry (EIM-IRMS®), is capable of providing unique molecular fingerprint that cannot be reproduced or counterfeited.

Today we know that δ18O value from the wine water is one of the most important parameters which can give information about wine geographical origin. Earlier we have suggested that grape juice or grape pulp is a closed biochemical system in which all chemical compounds stand in dynamic equilibrium and are in direct connection with each other. Taking that into consideration we have concluded that if system is genuine and if no water, or no sugar has been added to the grape must or grape juice prior to alcoholic fermentation, then ethanol which is made in process of alcoholic fermentation will have specific δD value of non-exchangeable hydrogen stable isotopes which will be in range from -205 to -215 ‰ vs. V-SMOW.

In this work we will show that this value, which we named δDn (non-exchangeable hydrogen stable isotopes in ethanol), is very important because it can support or refute conclusions drawn from the wine water δ18O value. If water is added prior or during alcoholic fermentation, final ethanol δDn value will fall outside of the range of -205 to -215 ‰ vs. V-SMOW, while wine water δ18O value may still appear valid for the wine origin. We are certain that measuring wine water δ18O alone could give wrong impression about wine origin.

With the new set of ethanol δDn and wine water δ18O results obtained from genuine wine samples from different vintages and from different geographic destinations (Serbia and USA), we are more certain that EIM-IRMS® method can help in determination of geographical origin and give additional information about wine authenticity and also important information about illegal production practices (addition of sugar and/or dilution with water) in wine production.

Keywords: Isotope Ratio Mass Spectrometry (IRMS), Wine, Authenticity, determination of origin