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High density balsamic vinegar: application of stable isotope ratio analysis to determine watering down.

Abstract

Aceto balsamico di Modena IGP (ABM) is an Italian worldwide appreciated PGI (Protected Geographical Indication) vinegar, obtained from cooked and/or concentrated grape must (at least 20% of the volume), with the addition of at least 10% of wine vinegar and a maximum 2% of caramel for color stability (EU Reg. 583/ 2009). The geographical origin of ABM ingredients is never specified. Since 2013, the European Committee for Standardization (CEN) has issued a method for determining the water fraudulently added to the vinegar and the balsamic vinegar product (EN16466-3 18O-IRMS). The method is based on the stable isotope ratios analysis of the bulk ABM sample (expressed as $\delta^{18}\text{O}$ in ‰ with respect to the international standard V-SMOW2).

Balsamic vinegars with very high density (higher than 1.37 g / mL of sugar) are available on the market. They are obtained by adding a high amount of concentrated must or by a long aging of the product in the barrel, which leads to an intense evaporation and concentration.

Products with such high density cannot be analyzed by using the official method as reported in the EN16466-3 18O-IRMS. Indeed, in this conditions, the equilibration between CO₂ and the water in the sample, being the base principle of the process, does not occur.

In this work, the official method has been modified and validated, calculating repeatability (*r*) and reproducibility (*R*), by proceeding with a prior dilution of the sample and by applying a correction to the data in order to eliminate the diluent isotopic contribution. Considering the limit value of $\delta^{18}\text{O}$ for a non-watered product reported in the literature for vinegar and for rectified concentrated must [1-2], the threshold limit of $\delta^{18}\text{O}$ below which the ABM product can be considered as adulterated was identified.

References

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- [2] Food Control 2013, 29(1), 107–111

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Authors

Perini Matteo¹, Pianezze Silvia¹ and Paolini Mauro

¹FONDAZIONE EDMUND MACH

Contact the author

matteo.perini@fmach.it

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