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BOOK OF ABSTRACTS

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The Han River (HR) is the largest river in South Korea which runs through a metropolitan area, Seoul, supporting industrial and agricultural activities, and residential water. It consists of two major tributaries, the North Han River (NHR) and South Han River (SHR), of which lithologies are quite distinct, silicates and carbonates, respectively. Total 14 samples were collected along with each river, each six in the NHR and SHR, and two in the main channel of the HR, in order to investigate the level of nitrate and their sources in the Han River basin.

Average concentration of NO_3^- in both rivers was little different with 12 mg/L, while a dual isotope was quite distinct. The $\delta^{15}N_{NO3}$ values of the NHR ranged from +2.9 to +8.0‰, with an average of +5.9‰ and those of the SHR ranged from +7.2 to +10.8‰, with an average of +8.4‰. Similarly, the $\delta^{18}O_{NO3}$ values of the NHR varied from –0.8 to +4.5‰, with an average of +2.4‰ and those of the SHR varied from +2.6 to +6.7‰, with an average of +4.6‰. A plot of $\delta^{18}O_{NO3}$ versus $\delta^{15}N_{NO3}$ indicates that nitrate in the NHR is mainly from soil organic matter, while septic waste and/or manure are the main sources in the SHR. Furthermore, as the HR flows through Seoul, it becomes affected by septic waste. This study suggests that better management of septic systems in the Han River basin is needed to prevent nitrate pollution and to protect residents.

041 – STABLE ISOTOPE RATIO ANALYSIS FOR VERIFYING THE AUTHENTICITY OF BALSAMIC WINE VINEGAR

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Balsamic vinegar of Modena, which recently obtained PGI status (Protected Geographical Indication) with EC Regulations 583/2009, is a common salad dressing obtained by mixing wine vinegar, caramel and grape must. Wine vinegar is defined by EC Regulations 479/2008 (Annex IV, sections 1 and 17) and 123/2007 (Annex XI ter, sections 1 and 17) as a product obtained exclusively from the acetous fermentation of wine, which is in turn defined as a product exclusively obtained from the alcoholic fermentation of fresh grapes, whether crushed or not, or from grape must.

According to this definition, wine vinegar cannot contain acetic acids obtained from either petroleum derivatives or the pyrolysis of wood (synthetic acetic acid) or from the fermentation of sugar not coming from grapes (e.g. beet and cane sugar).

Since 2000 the Organisation Internationale de la Vigna et du Vin (OIV) and more recently the European Committee for Standardization (CEN) have established official isotopic analytical methods in order to detect the illegal addition of sugar to wine vinegar (OIV resolution 71/2000, EN 16466).

Isotopic methods are based on determination of the D/H ratio in the methylic site of acetic acid using SNIF-NMR (Site Specific Nuclear Isotope Fractionation- Nuclear Magnetic Resonance) and the $^{13}C/^{12}C$ ratio of acetic acid using IRMS (Isotope Ratio Mass Spectrometry). Acetic acid is extracted from the sample by liquid-liquid extraction and purified using a Cadiot column, obtaining a solution with an acetic acid content higher then 80%.

In this study we investigated the variation in D/H and $^{13}C/^{12}C$ values from wine ethanol to acetic acid in vinegar and balsamic vinegar, in order to determine whether the two CEN methods can also be applied to balsamic vinegar. The $^{13}C/^{12}C$ of the extracted acetic acid was measured both using an EA (Elemental analyser)-IRMS, which measures the bulk solution, and GC-C-IRMS (Gas chromatography – combustion), which can measure pure acetic acid.

Fifteen different production chains were considered, each made up of wine, wine vinegar, must, caramel and balsamic vinegar. Furthermore, two different experiments with adulterated samples (with the addition of beet and cane sugar) were carried out.

In none of the production chains was there any variation in the D/H and $^{13}C/^{12}C$ values from wine ethanol to acetic acid extracted from both wine vinegar and balsamic vinegar. This means that CEN methods can also be used for analysis of balsamic vinegars. The $^{13}C/^{12}C$ of acetic acid can be indifferently measured using an EA-IRMS or GC-C system, obtaining the same results.

References

1. EC Regulations 583/2009 of 3 July 2009 entering a name in the register of protected designations of origin and protected geographical indications [Aceto Balsamico di Modena (PGI)].
2. EC Regulations 479/2008 of 29 April 2008 on the common organisation of the market in wine.
3. Method OIV Resolution 71/2000 Vinaigres de vin – Authentification par FINS-RMN ® et d'autres methodes isotopiques.
4. Method CEN EN 16466 Vinegar – Isotopic analysis of acetic acid and water.