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AUTHENTICITY OF SWEET RESERVE - DETECTION OF BEET SUGAR IN WINE USING KRUEGER FORMATES

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Today's common oenological practice to produce semi-dry wines consists of a complete fermentation first and then adding back "sugar", the so called sweet reserve. For the purpose of sweetening wines after fermentation only the addition of grape must or concentrated grape must (also rectified) is permitted. The addition of foreign sugar like sucrose from beet is illegal. This should not be confused with chaptalization which is the enrichment of the must prior fermentation to enhance the alcohol content. This is allowed under certain conditions.

To check for an illegal addition of sugar to wine, it is useless to look for the presence of sucrose since a "smart" fraudster will use full invert syrups which show the natural sugar composition of grapes (glucose/fructose : 1/1). In such cases, the residual sugar can be evaluated by stable isotope ratio analysis. The available detection method implies the fermentation of the isolated sugar, quantitative distillation and NMR analysis of the ethanol. Using SNIF-NMR (site-specific natural isotopic fractionation nuclear magnetic resonance) the addition of C3-sugars like beet can be verified. In principal this concept works but there are major disadvantages which are first and foremost the need of an expensive NMR instrument. Furthermore, it is very time-consuming because of the fermentation and fairly large sample volumes are needed which can limit the possibility to carry out an analysis.

We present a novel method to proof the illegal addition of beet invert sugar to wine using so-called Krueger Formates. The principal of the method is to convert the residual sugars to formic acid followed by a steam distillation and precipitation as calcium salt. Now the hydrogen isotope ratios of the calcium formate can be determined. They display only the non-exchangeable hydrogen of the sugar, a requisite for a successful method. The $\delta^2\text{H}_{\text{V-SMOW}}$ -values of beet sugar with about -80‰ differ significantly from those of the wine (grape sugar) with about 10‰ and usually more which enables the detection of a foreign sugar addition. Compared to the SNIF-NMR concept the Krueger Formate method can be done in a much shorter time, needs much less sample and uses IRMS or CRDS for the detection which are much more common and less costly than NMR. First measurements already convicted a counterfeiter so to speak in flagranti.

Keywords: wine fraud, foreign sugar addition, full invert syrup, sweet reserve, SIRA

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