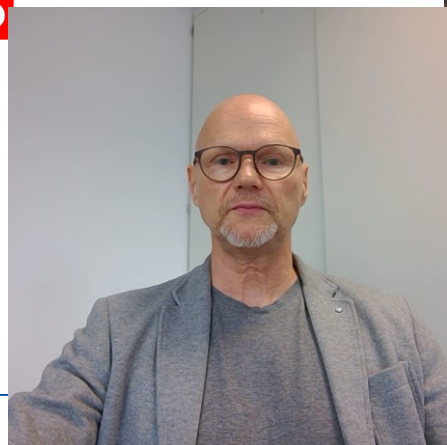


Introduction Part B

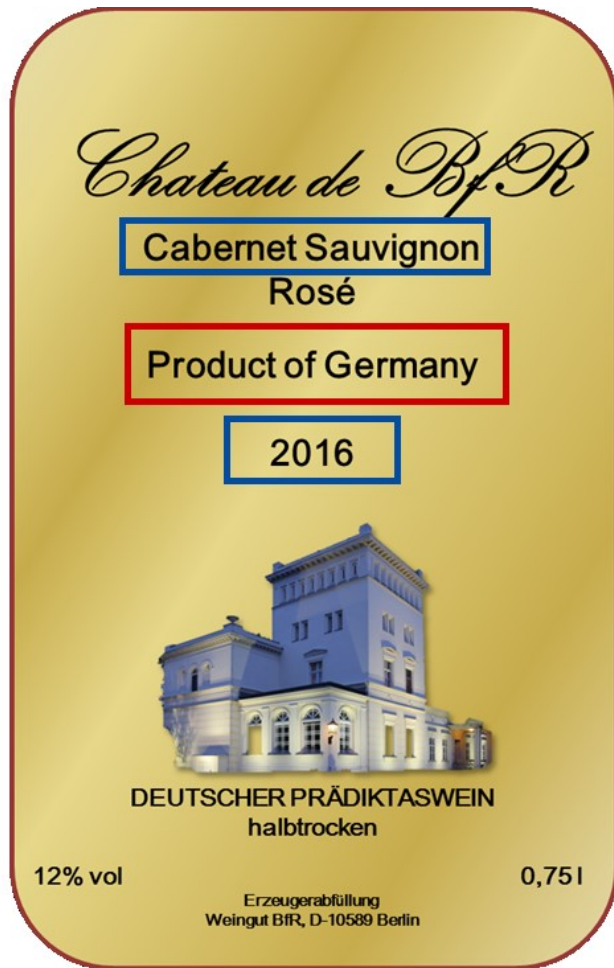
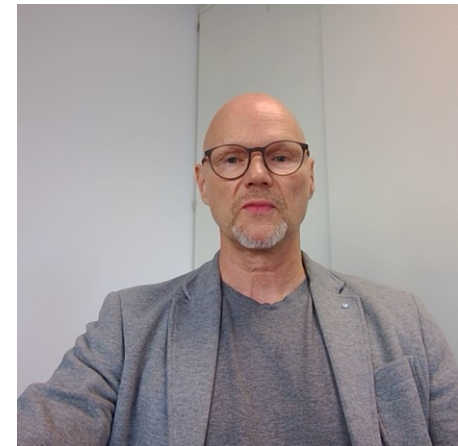
Different Approaches to test Authenticity
(of Wine)



Senior expert office for the import control of wine



Wine authentication



Authenticity



Labeling

Recent cases of Food Fraud



Date	Fraud
04/2018	Chaptalisation of Medoc Wine in Bordeaux Region, 397 hectolitres, worth 2.3 million Euro
03/2018	Mislabeled , cheap wine labeled as high-quality Côtes-du-Rhône wine, more than 66 million bottles
11/2017	Imitation of reputed brand , counterfeit Australian wine on Chinese online market

- JRC publishes every month a summary of articles on Food Fraud and Adulteration, content is retrieved mainly from the JRC tool Medisys

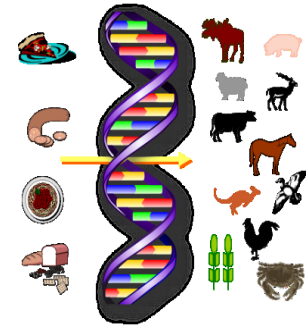
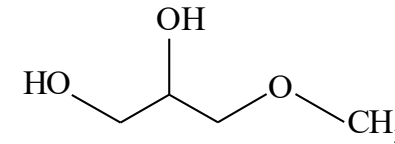
<https://ec.europa.eu/jrc/en/food-fraud-and-quality/monthly-summary-articles>

Analytical approaches for authentication

(for food analysis?)

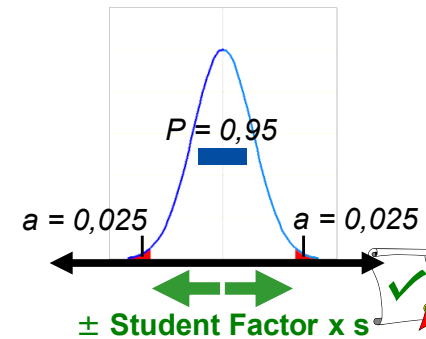
Targeted analysis

1. "exogenous" compounds



Targeted analysis

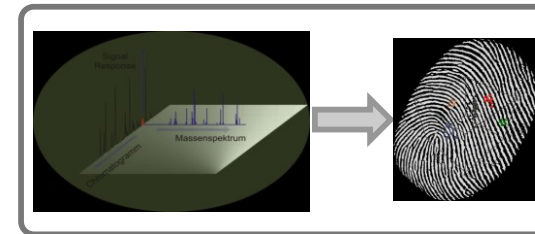
2. authenticity range of analytes (natural ingredients)



^{13}C ^{18}O
 ^2H

Non-Targeted analysis

3. novel approaches (e.g. fingerprinting, profiling)

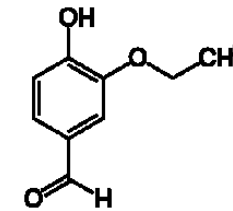


Analytical approaches for wine authentication

Exogenous marker compounds:

Flavours, dyes, 3-MPD, cyclic diglycerols, sweeteners, sorbitol,....

1. Exogenous compounds naturally not present in wine



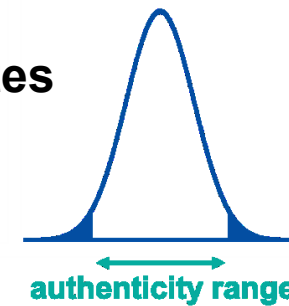
COMPENDIUM OF INTERNATIONAL METHODS OF WINE AND MUST ANALYSIS



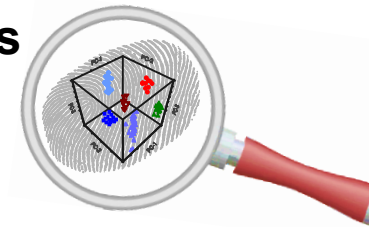
INTERNATIONAL ORGANISATION OF VINE AND WINE



2. Authenticity range of analytes (natural ingredients)



3. Novel approaches (e.g. fingerprinting)





Glycerol addition to wine

- ◆ Glycerol has a sweet taste and it is supposed to contribute to the mouth feeling



- ◆ Glycerol 4,8-14 g/l
- ◆ Natural constituent of wine

- ◆ Methods:
 - ◆ Wet chemistry, GC, HPLC, NMR



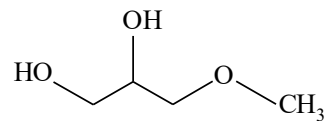
- ◆ Small additions - 15-30 % of the total glycerol - difficult to detect



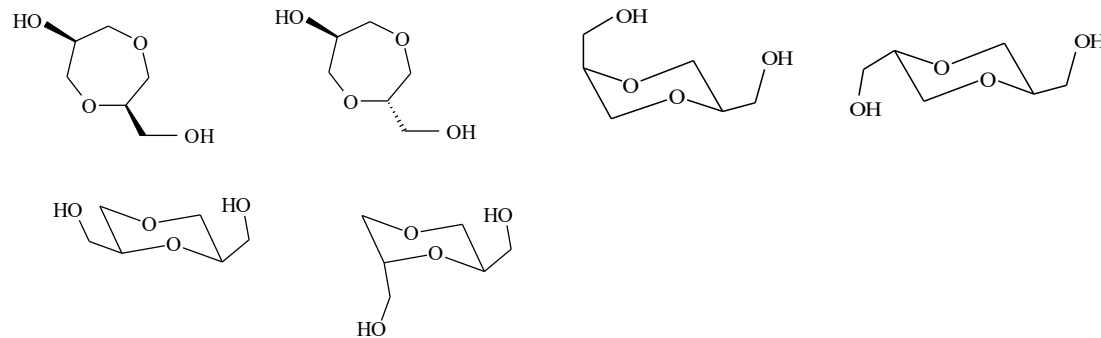
Glycerol addition to wine

◆ By-products in technical glycerol (not naturally present in wine)

3-Methoxy-propandiol



Cyclic Diglycerols (dioxane, dioxepane)



◆ 1997: 140 of 850 wine samples (mainly German) were “positive” (16 %)

◆ 1999: 3 of 150 were “positive”

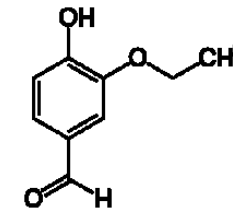
◆ OIV-MA-AS315-15 (OENO 11/2007) Type II

Analytical approaches for wine authentication

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COMPENDIUM OF INTERNATIONAL METHODS OF WINE AND MUST ANALYSIS

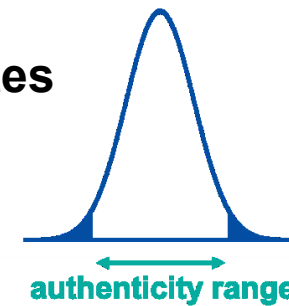


INTERNATIONAL ORGANISATION OF VINE AND WINE

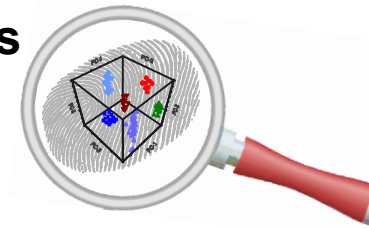
Authenticity ranges:

stable isotopes, shikimic acid, minerals...

2. Authenticity range of analytes (natural ingredients)



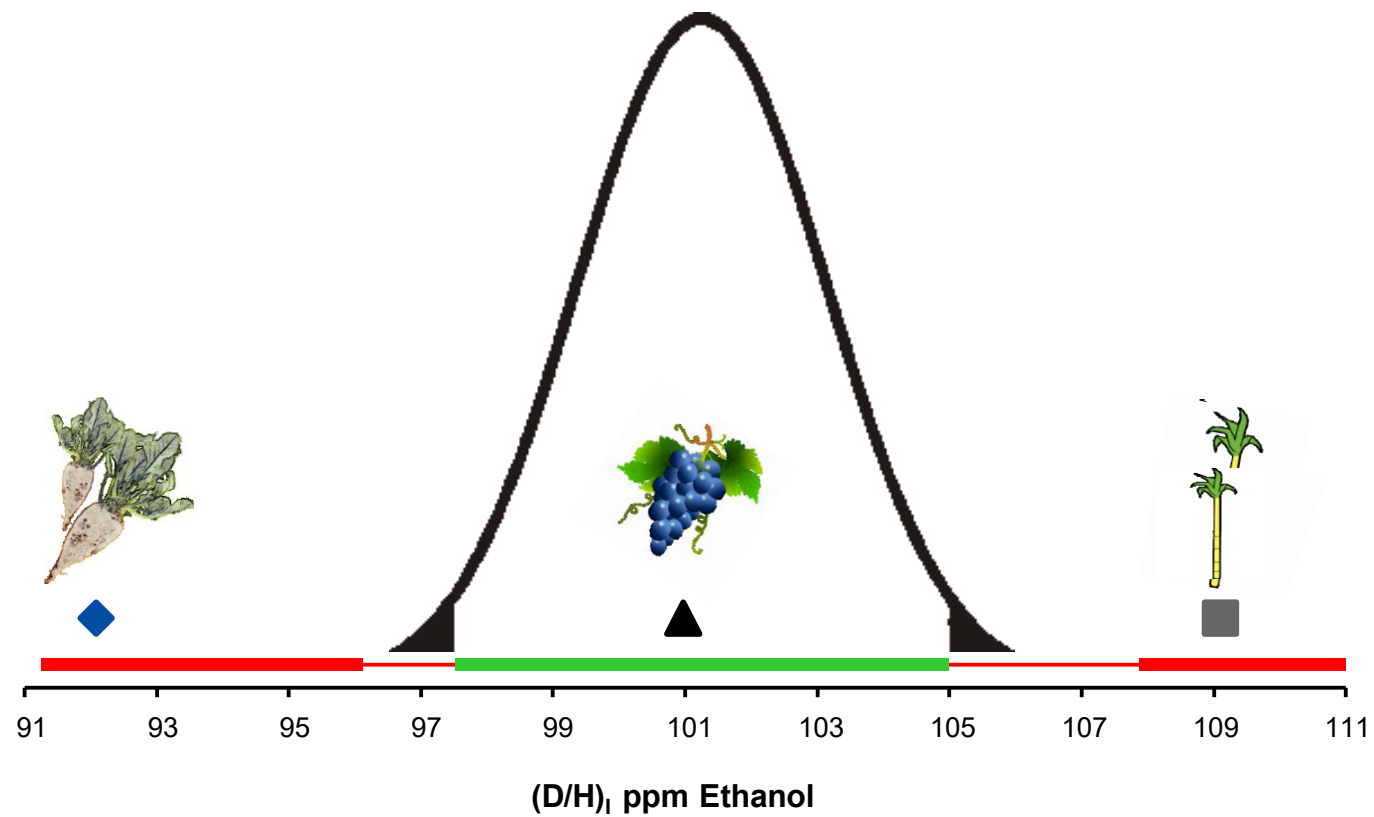
3. Novel approaches (e.g. fingerprinting)



Wine authentication



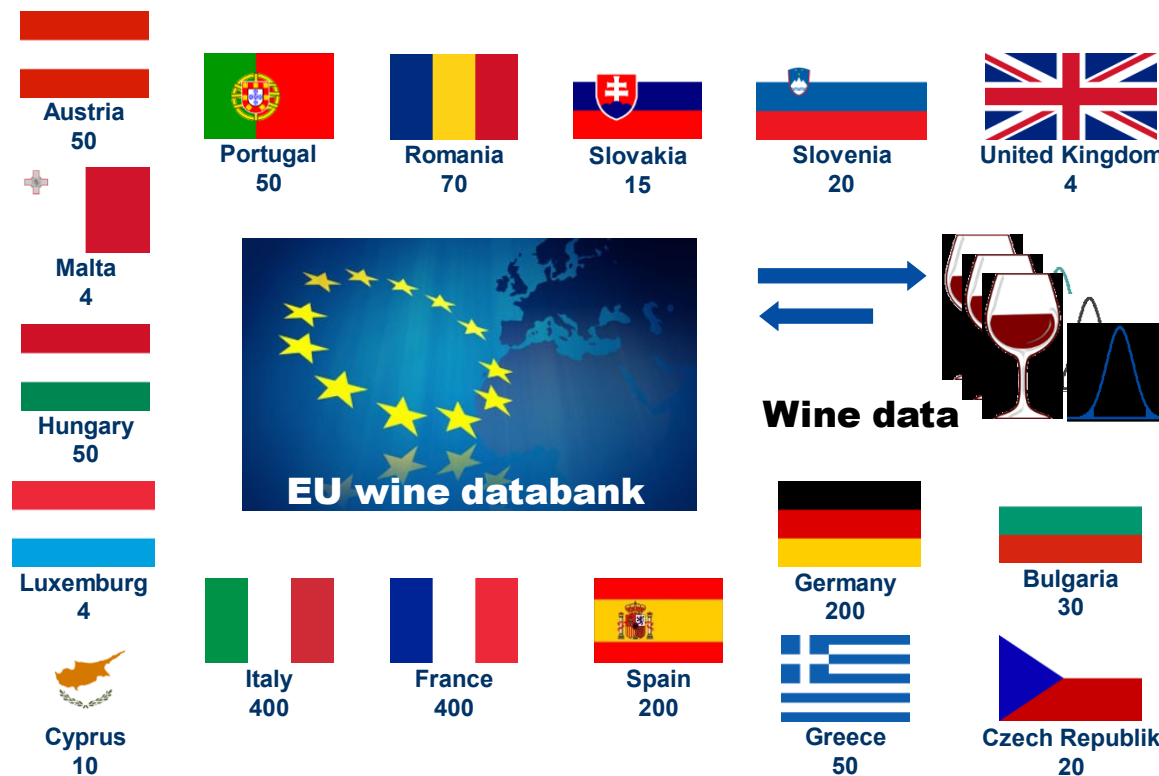
- Detection of chaptalization/sweetening by **SNIF-NMR spectroscopy**





Reference data

- European Wine Databank according to Regulation (EC) 555/2008
- Since 1991: more than 1,500 authentic wines per year \Rightarrow >35,000 samples



JRC IRMM
European Reference Centre
for Control in the Wine Sector



Stable Isotope Analysis of Wine



D/H of wine ethanol

COMPENDIUM OF INTERNATIONAL ANALYSIS OF METHODS - OIV
Determination of the deuterium distribution in ethanol by
SNIF-NMR

Method OIV-MA-AS311-05

Type II method

COMPENDIUM OF
INTERNATIONAL METHODS
OF WINE AND MUST ANALYSIS

$^{13}\text{C}/^{12}\text{C}$ of wine ethanol

COMPENDIUM OF INTERNATIONAL METHODS OF ANALYSIS - OIV
Ethanol

Method OIV-MA-AS312-06

Type II method



$^{18}\text{O}/^{16}\text{O}$ of wine water

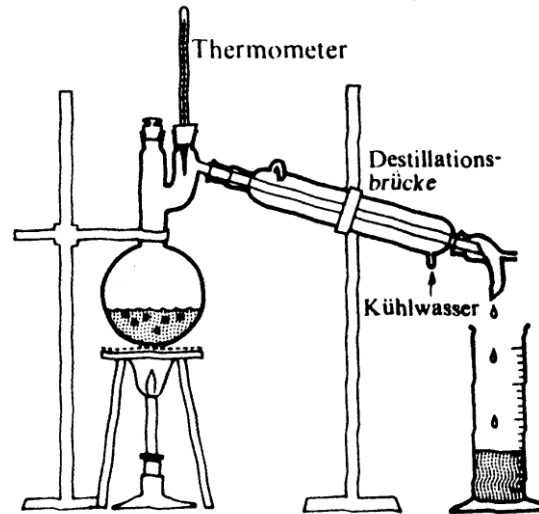
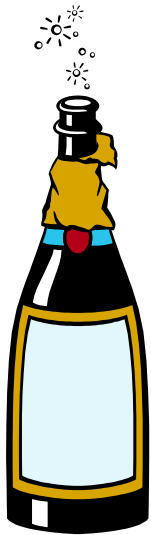
COMPENDIUM OF INTERNATIONAL METHODS OF ANALYSIS - OIV
Isotopic ratio of water

Method OIV-MA-AS2-12

Type II method

INTERNATIONAL ORGANISATION
OF VINE AND WINE

What we will highlight in this workshop:



Distillate



^{18}O of Wine Water
(OIV method)

SNIF-NMR
(OIV method)

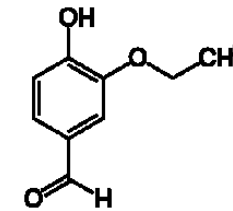
^{13}C of Ethanol
(OIV method)

Analytical approaches for wine authentication

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1. Exogenous compounds naturally not present in wine



COMPENDIUM OF INTERNATIONAL METHODS OF WINE AND MUST ANALYSIS



INTERNATIONAL ORGANISATION OF VINE AND WINE

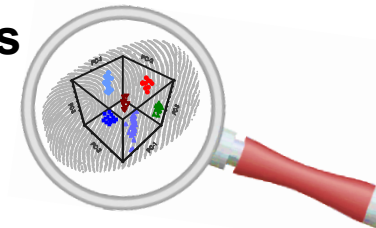
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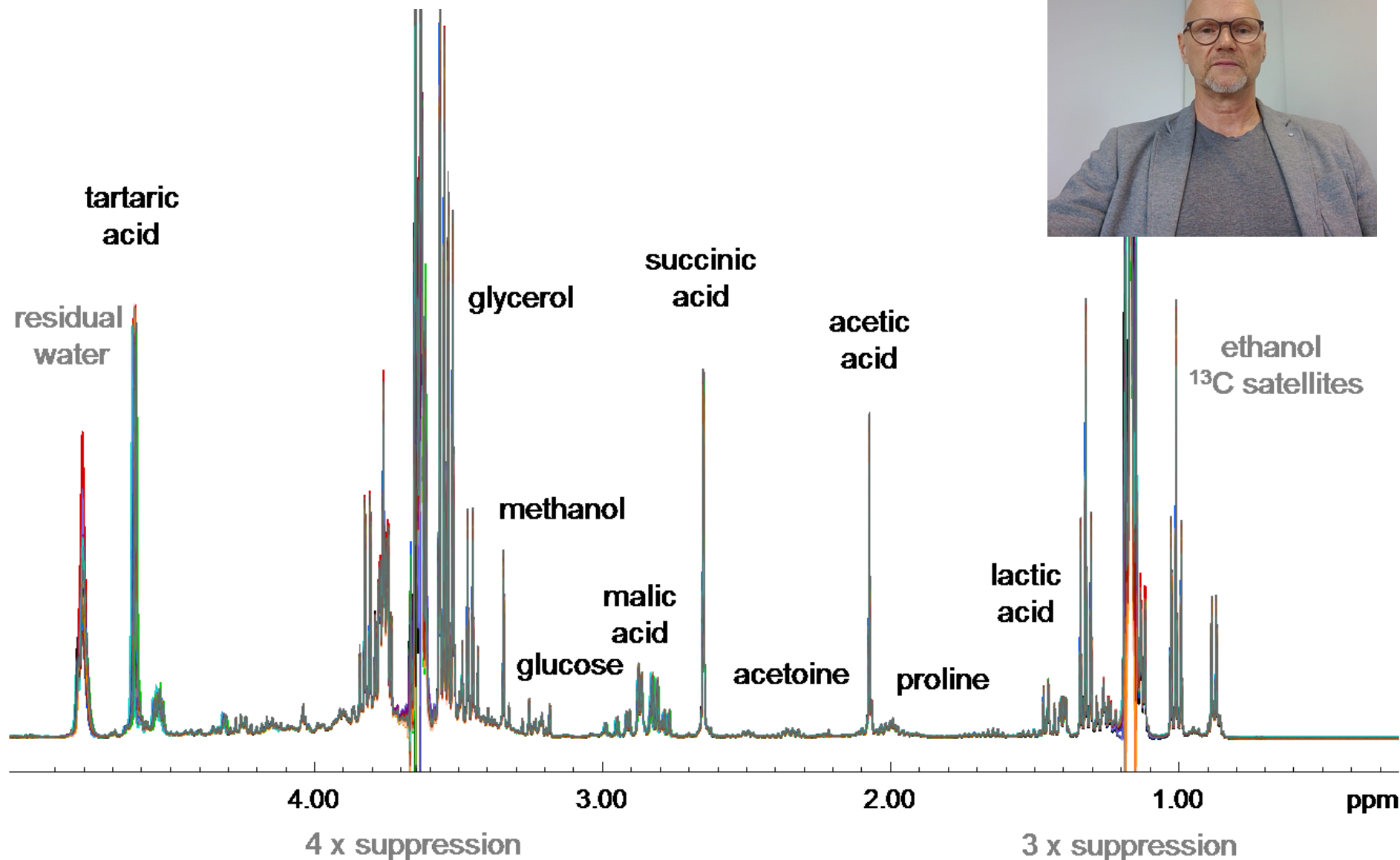
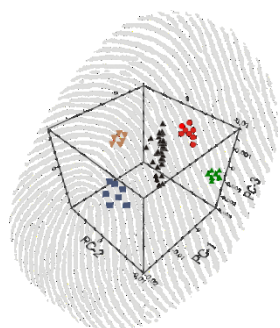
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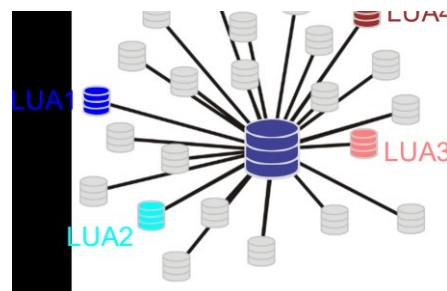


$^1\text{H-NMR}$ spectroscopy in official wine control



P. A. Solovyev, C. Fauhl-Hassek et al. *Comprehensive Reviews in Food Science and Food Safety* 2021, 1-23.

Project Winechecker: Use of $^1\text{H-NMR}$ spectroscopy in official wine control – joint usage of spectra database





Thank you for your attention

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