

**DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY MENDEL UNIVERSITY
IN BRNO (MENDELU)**

- 130 employees
- More than 750 m² of laboratories
- World-class instrumentation
- Part of the Central European Institute of Technology (CEITEC)

Research and development of advanced materials and approaches in physiology, biology, biochemistry and chemistry are the main vision of the abovementioned team. There are several laboratories dedicated to key areas such as bioanalytical chemistry, experimental microbial and animal biochemistry and biology, and, last but not least, algae and plant biotechnology and their utilization in agriculture, environment, functional food and plant protection. The instrumental equipment available enables the researchers to participate in a large number of grant projects at all levels – internal, national and international. Recent and current ongoing projects awarded by European Commission include:

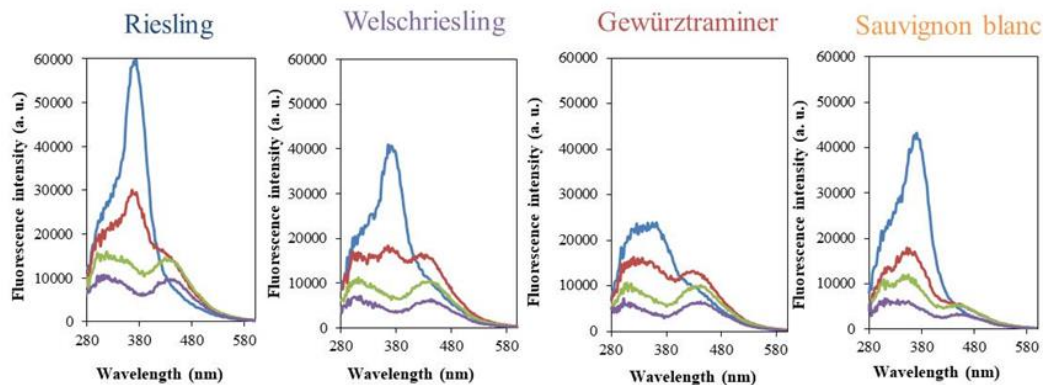
- 2019-2023 - H2020. InteGRated systems for Effective ENvironmEntal Remediation, GREENER
- 2018-2022 - Towards the Understanding a Metal-Tumor Metabolism, ERC Starting Grant, ERC-2017-STG, senior staff, budget 1 300 000 EUR
- 2017-2021 - H2020. Galileo Enhanced Solution for Pest Detection and Control in Greenhouse Fields with Autonomous Service Robots (776324-GREENPATROL)
- 2017-2018 - H2020 – 763685 Back for the Future (Back4Future)
- 2015-2016 - H2020-JTI-IMI2-2014-02-single, Ultra-Fast Molecular Filovirus Diagnostics „FILODIAG“, IMI2-2014-02-05, team member, budget 340 000 EUR
- 2012-2015 - Centre of excellence, Czech science foundation, Evolution and function of complex plant genomes. P501/12/G090.

Project idea: UV-fingerprinting for sensitive and accurate food fraud detection

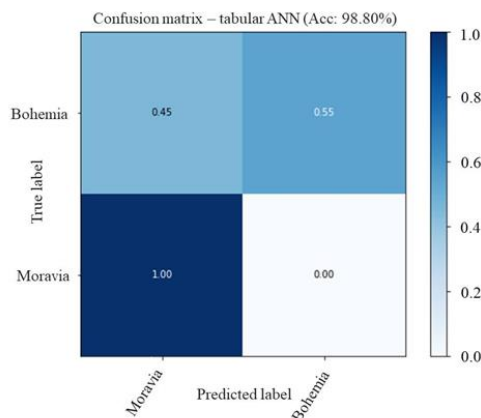
The fingerprinting approach can be used for profiling and identification purposes in either medical and forensic applications or the analysis of various complex matrices consisting of mixtures of drugs, beverages or natural products (vegetables, fruit and plant extracts, etc.) In other words, fluorescence fingerprinting enables to monitor fraud and origin of seafood, fish, meat, milk, dairy foods.

UV-fingerprinting of wines use case

UV-fingerprinting is a unique fluorescence-based method, which has been applied and validated to distinguish wine varieties.



Through an analysis of 1045 wine samples, an artificial neural network was trained enabling to distinguish 2 regions of the origin of the wine (Bohemia and Moravia). The trained model achieved 98.8% accuracy.

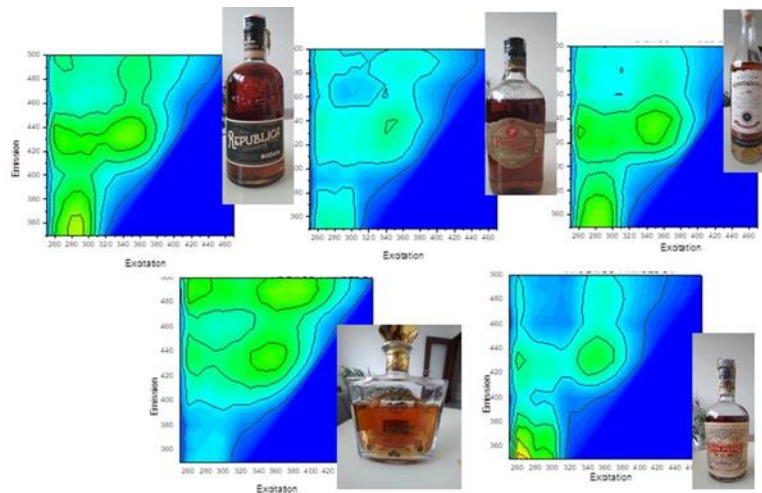


Raman spectroscopy is one of the methods of vibration molecular spectroscopy that is used to chemically identify analytes contained in a sample. This phenomenon can be used to non-destructively identify the chemical composition of a sample by creating a set of spectra typical for given analytes. The disadvantage of Raman scattering is its relatively low intensity. Considerable purity of the analyzed sample is therefore necessary. Any fluorescence impurity or a possible photochemical reaction makes it impossible to carry out the analysis.

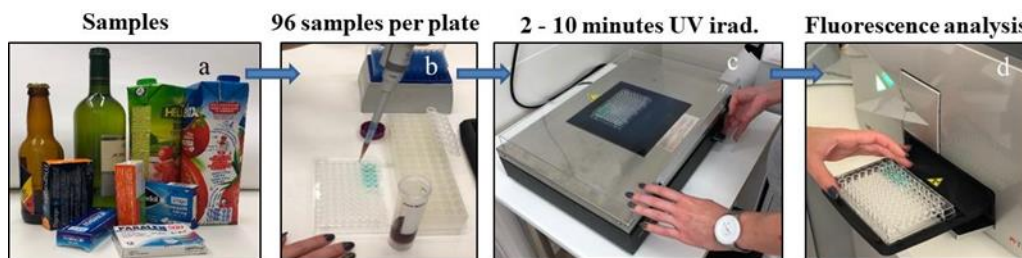
Conventional methods used for wine authenticity evaluation utilizing stable isotopes profiling include isotope ratio mass spectrometry, inductively coupled plasma mass spectrometry, nuclear magnetic resonance spectroscopy. These methods are extremely demanding in terms of expensive and sophisticated instrumentation, which can be operated only by highly educated personnel and cannot be miniaturized.

UV-fingerprinting of rums use case

Beside wines also geographical origin other beverages/spirits is of an interest. Current study in progress is concerning UV-fingerprinting of rums. Preliminary results are shown below; however measurement of large cohort of various samples is needed.



UV-fingerprinting is very cost-effective (1-50€ per analysis), time-effective (up to 100 samples can be analyzed within one hour). The sample consumption is very low (approx. 1 ml) and common, relatively inexpensive instrumentation (approx. 10,000 €) which can be operated with briefly trained person is required. Moreover, it can be easily miniaturized to a brief case size or hand-held instrument suitable for in-field analysis. The overall procedure is very simple (see below).



The technology has been validated on several use cases and is ready to be used for a variety food fraud applications.

Possible Horizon Europe calls:

- HORIZON-CL6-2022-FARM2FORK-01-11: Effective systems for authenticity and traceability in the food system

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