Novel Trifold Model for Characterization of Fatty Plant Oils

Sabine Krist[1], Gerald Stübiger[2], Wolfgang Werther[3]

[1] Department of Clinical Pharmacy and Diagnostics, University of Vienna, Althanstr. 14 UZAII, A-1090 Vienna, Austria.

[2] Center of Biomolecular Medicine and Pharmacology, Medical University of Vienna, Schwarzspanierstraße 17, A-1090 Vienna, Austria.

[3]Laboratory of Mass Spectrometry Prof. Schmid, Rötzergasse 57, 1170 Vienna, Austria

Oils of high dietary value (e.g. olive oils) and especially those ones used for pharmaceutical and medicinal purposes (e.g. sweet almond oil) have to be of outstanding high quality that can be seriously weakened by blending and adulteration. Routine methods for quality control of fatty plant oils, like the determination of fatty acid composition, often do not provide satisfying results, as usually oils with almost similar fatty acid composition are used for blending.

An economic loss of approximately 4 million Euros per year for the member states of the European Union is reported for the adulteration of olive oil with hazelnut oil. Furthermore, adulteration of food products, involving the replacement of high-cost ingredients with cheaper substitutes, is a type of economic fraud that can pose a major health threat to consumers, regarding e.g. the Spanish toxic oil syndrome.

Considering this challenge for food analysis as well as for pharmaceutical analysis, we developed a new analytical technique for monitoring plant fats and oils combining the detection of volatile compounds by using SPME-GC-MS (Solid Phase Micro-Extraction-Gas-Chromatography-Mass Spectrometry), triacylglycerol-profiling by MALDI-TOF-MS (Matrix Assisted Laser Desorption/Ionization-Time-of-Flight-Mass Spectrometry) and PCA (Principal Component Analysis) and related multivariate data analysis techniques.

According to our results the combination of SPME-GC- and MALDI-TOF- Mass Spectrometry offers the possibility to obtain information about basic raw materials (i.e. genuine oils), processing conditions (i.e. oil extraction and refining methods) as well as the origin of the samples. The use of both analytical techniques, assessing complementary parameters, is based on the fact that the headspace of fatty plant oils is dominated by degradation products of the oils.