VARENA 2019 - Congrès International 'Valorisation des Ressources Naturelles : De la Recherche Scientifique à la Faisabilité Socio-économique' ; Rabat, Maroc ; 2019.06.26-28

Analytical tools for the detection of adulteration of edible oils

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Since man has started to produce and sell food, there is the phenomenon of food fraud. Examples from former times are the addition of sand to flour for the production of bread or water to wine. These activities are always driven for economic reasons in combination with criminal energy, and at least the consumer pays money for a value impaired product. In the worst case the health of the consumer can be affected, as with the Toxic Oil Syndrome in 1981, when rapeseed oil was denatured by the addition of aniline and sold as olive oil. Looking for the ranking of the most counterfeited food items worldwide olive oil is within the top 10, but this also applies other high-value edible oils. These adulterations concern in particular wrongly labelled quality, not declared or illegal processing or wrong indication of geographical origin.

Almost as old as food fraud is the search for ways to prove it. In earlier times, simpler analytical methods, such as density measurement for the detection of the addition of water to wine were used for this purpose. Today more and more sophisticated devices are used to track down counterfeiters. But there are also a lot of methods in between that use specific parameters of edible oils to detect adulteration such as the composition of fatty acids, tocopherols, sterols, triacylglycerols or other specific compounds or the combination of these compounds. In addition statistical tools become more and more popular that help to detect significant differences between oils that otherwise remain undetected.

The presentation will give an overview of the different possibilities for the detection of adulteration of edible oils, starting with the application of standard methods for the investigation of the most important constituents. Since the significance of these compounds is limited, more and more sophisticated methods are being developed, which not only consider individual known compounds or groups of compounds, but also have the profile of a large number of unknown compounds in view. The hope is that these untargeted methods in combination with statistical tools such as Principle Component Analysis or Linear Discriminant Analysis may help to find significant differences e. g. between edible oils from different origin or different processing. These methods focusses either on the volatile compounds, on polar or nonpolar extracts of edible oils as in the case of GC and HPLC methods in combination with MS detectors or spectroscopic methods such as NIR or NMR uses the different spectra of the samples. Finally the new German National Reference Center for the Authenticity of Food is presented.