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Is profiling of volatile compounds from virgin rapeseed oil a promising tool for the assessment of the sensory quality?

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Background: The sensory quality of virgin rapeseed oil is an important argument for the buying decision of consumers but the sensory evaluation according to method DGF-CII 1 (14) - Appearance - Sensory assessment - is personnel and time-consuming and has some uncertainties. That makes an easy and reliable quality control of virgin rapeseed oil difficult.

Objectives: The aim of a project supported by the Union for the Promotion of Oil and Protein Plants and the Research Association of the German Food Industry was the development of a chemometric approach for the differentiation of sensory good and bad (musty/fusty) virgin rapeseed oils on basis of selected volatile compounds analysed by dynamic headspace GC-MS.

Methods: Volatile compounds were extracted by dynamic headspace (DynHS) from a set of 20 sensory good and 23 sensory bad virgin rapeseed oils and determined by gas-chromatography (GC) combined with mass spectrometry (MS) for identification. The aroma active compounds were specified by GC-olfactometry (GC-O). Aroma active compounds with significant differences in the concentration between sensory good and bad oils were identified by statistical methods. Finally Linear Discriminant Analysis was used to obtain a discriminant function for the differentiation of sensory good and bad oils.

Results: In a first step a total number of 64 volatile compounds were detected in sensory good and bad virgin rapeseed oils by dynamic headspace GC-MS while only 41 compounds showed aroma activity evaluated by GC-olfactometry. From this initial set of substances, 13 volatile compounds showed significant differences in the concentration between the two groups of oil, whereas their concentration was higher in sensory bad oils. No significant differences were found for compounds characterizing sensory good virgin rapeseed oils. On basis of these 13 volatile compounds a Linear Discriminant Analysis was conducted to classify a training dataset of 43 samples satisfactorily according to the sensory quality. Finally a data set of 19 samples of rapeseed oil was successfully used to check the suitability of the resulting discriminant function for the differentiation of sensory good and bad oils.

Conclusions: The investigation revealed that a chemometric approach on basis of DynHS-GC analysis in combination with statistical means is useful to differentiate sensory good and bad virgin rapeseed oils. It was shown that this approach is a helpful tool to support the sensory analysis and assessment of virgin rapeseed oils.

This IGF Project of the FEI was supported via AiF within the programme for promoting the Industrial Collective Research (IGF) of the German Ministry of Economics and Energy (BMWi), based on a resolution of the German Parliament.