

Optimization and Application of a HS-SPME-GC Method for the Analysis of Volatile Compounds of High Oleic Vegetable Oils

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The stability of vegetable oils and fats concerning thermal stress is determined to a considerable degree by the fatty acid profile of the vegetable oils and fats. In recent years vegetable oils with modified fatty acid profiles, e.g. high oleic varieties of sunflower or rapeseed oil, entered the market and are used in the food processing.

Volatile compounds with low odor threshold values play an important role in the sensory quality assessment of vegetable oils. Thermal stress in general or during food processing has an effect on the amount of these volatile compounds in vegetable oils or food products thereof.

Different analytical methods for the analysis of volatile compounds are available of which the headspace solid phase microextraction (HS-SPME) is known a solvent free sensitive and easy to use method. SPME was established by Pawliszyn [1] and was recently applied in the analysis of foods and beverages [2].

The present study can be divided into three parts. The first part deals with the qualitative analysis of the volatile compounds derived from thermally stressed sunflower and rapeseed oils. Samples were analysed by HS-SPME and GC-MS [3,4]. The second part focused on the optimization of the HS-SPME method applying an experimental design approach. According to the established Box-Behnken design the optimized parameters were extraction time, extraction temperature and sample amount. The calibration was done with aldehyde standards selected according to their odor threshold and indices and their occurrence in the vegetable oil samples. In the third part of the study this optimized HS-SPME method was applied to study the development of volatile compounds derived from high oleic and conventional sunflower and rapeseed oils exposed to accelerated storage conditions. These vegetable oils were stored at 80°C for 14 days in total and samples were taken every second day.

Results from the accelerated storage test showed significant differences between the volatile compounds derived from rapeseed oils and sunflower oils (high oleic and conventional) over time.

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