

Formation of oxidized fatty acids during pressing and storage of edible oils

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Objective

Virgin, cold pressed oils are produced by pressing the seeds at low temperature and sold at high prices. Therefore, these high-quality oils are a frequent target of food fraud such as applying heat during pressing to improve the oil yield. The assessment of the quality and authenticity of virgin oils is therefore of high importance for today's consumer who pay a higher price for a possibly inferior product. However, to date, no marker to verify the application of increased pressing temperatures exists and currently used parameters for quality control of oils are not able to detect the application of heat during processing of cold pressed oils. The quality grade of an edible oil is affected by the pressing process and the progress of lipid peroxidation, both resulting in the formation of aroma active compounds. During oil pressing and storage several enzymatic catalyzed as well as autoxidative processes take place leading to numerous oxidative products such as oxidized fatty acids, i.e. oxylipins. Oxylipins cover a broad spectrum of secondary products of lipid peroxidation and enzymatic activity during oil pressing. This leads us to hypothesize that oxylipin concentration in an oil indicates its degree of oxidation. Moreover, the pattern of oxylipins may allow a distinction between cold pressed oils and oils obtained at higher pressing temperatures, since specific oxylipins are formed in the different pathways.

Methods

Rapeseeds, sunflower seeds and flaxseeds are processed in lab-scale (2 L) in a screw press to virgin oils and oils obtained at higher temperatures. The resulting oils are stored at room temperature. Free and total oxylipins as well as their precursor fatty acids are analyzed directly after pressing the oils and during storage by means of LC-MS (2,3). Total oxylipins are extracted from matrix by solid phase extraction (SPE) using a C8/anion exchange cartridge material following hydrolysis (1). An aliquot of this hydrolysate is also used for quantification of total fatty acids by means of LC-MS. Free oxylipins and free fatty acids are separated from matrix by SPE on an aminopropyl cartridge material (4).

Results and Conclusion

The use of oxylipins to describe the oxidative state of edible oils is a new approach to assessing their quality. On our poster, we will show first results regarding the formation of oxylipins resulting from cold pressing or pressing at higher temperature as well as from oil storage.

(1) A. I. Ostermann, E. Koch et al. 2020. Prostag Oth Lipid M. 146. (2) L. Kutzner et al. 2019. Front Pharmacol. 10:169. (3) K. M. Rund et al. 2018. Anal Chim Acta. 1037:63-74. (4) L. Kutzner et al. 2017. J. Agric. Food Chem. 65