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Developments in sample preparation methodology for trace elements extraction from olive oil

The need for quantifying more inorganic elements susceptible of being present in the environment at very low concentrations due to the issues of traceability, authentication and safety urges the development of more efficient methodologies for sample preparation. Multielemental analysis of olive oil by ICP-MS is challenging due to the risk of matrix effects caused by the high organic load of the samples. Sample preparation aims at mitigating these issues, however, conflicting standard operating procedures in preparation of olive oils prior to ICP-MS analysis have been reported. This study compared two current practices of microwave-assisted acid digestion, and liquid-liquid ultrasound-assisted extraction methods with an optimized combined microwave digestion-evaporation method to extract inorganic elements from olive oils. The main objective of this study is to develop a robust preparation method which allows the accurate and precise quantification by ICP-MS of major and trace elements in olive oil samples. The method and programs for these three methods are described and their results are compared to aid choosing the method that reaches higher performance judged by lower detection limits, higher sensitivity and higher precision. Overall, microwave digestion-based methods did not compare opportunely, and ultrasound-assisted extraction was found to provide the best accord between simplicity of use, detection limits and precision improvement. The ultrasound-assisted extraction is therefore recommended as a preparation method for olive oils prior to analysis by ICP-MS. The broader range of elements that can be accurately detected is expected a help to increase the discriminatory power and performance of geographical traceability models.

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