Alternative extraction methods for the recovery of bioactive compounds from agro-food by-products: PEF and Microwave assisted extraction from olive pomace and tomato by-products

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The agri-food industry produces significant quantities of by-products that are underutilized or wasted, negatively impacting sustainability and environment. Olive and tomato processing by-products are rich in bioactive compounds (BACs), i.e. polyphenols, carotenoids, which can be used as ingredients for the development of high added-value products and their effective recovery and utilization has been the focus of research.
The extraction procedures play a critical role in the yield and functionality of the contained phytochemicals. Novel green extraction technologies improve BACs extraction yields at lower temperatures and short processing times, compared to the conventional methods. Pulsed electric fields (PEF) and Microwave-assisted extraction (MAE) can be used as alternative methods for the recovery of BACs from agr?-food by-products, complying with environmental and economic requirements. This work aims to the evaluation of the efficiency of PEF and MAE extraction for increased recovery of BACs from olive and tomato pomace.
Different Microwave (150-600 W) and PEF (1-5 kV/cm, 100-1500 pulses of 15 μs width) conditions, and solvent concentration at 30-50°C for 10-30 min were studied. The characterization and quantification of the extracts were carried out using HPLC analysis (total carotenoids, lycopene), Folin-Ciocalteu method (total phenolics) and DPPH assay (antioxidant activity).
Results showed that the use of PEF and MAE is efficient for recovering BACs, i.e. polyphenols and lycopene, from olive and tomato pomace, in significantly shorter time as compared to conventional extraction. The olive pomace extracts with highest antioxidant activity obtained with 40% methanol at 30°C. The optimum conditions regarding recovery yield for lycopene were microwave processing at 150 W for 10 min at 50°C. Similarly, PEF increased phenolic compounds recovery from olive pomace by up to 90%, and total carotenoids by up to 50% from tomato wastes compared to untreated samples.
MAE and PEF can be considered fast, effective, and environmentally friendly techniques for extracting BACs from olive and tomato pomace, offering important advantages in terms of yield, selectivity, extraction times and quality.
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