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Galega cultivar olive oil semi-industrial production assisted by pulsed electric fields: Impact on extraction yield, physicochemical and sensorial quality

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Abstract

The olive oil extraction process employed significantly impacts the overall quality of the final product. Technological innovations aim to balance process efficiency and product quality. Existent industrial processes successfully demonstrated that pulsed electric fields (PEF) are a potential technology for increasing extraction yield without compromising olive oil quality. By inducing electroporation of plant cell membranes, PEF enhances the effective disruption of olive fruit tissue which can facilitate the extraction of olive oil and its minor constituents.

This work investigated the impact of PEF technology on the extraction of Portuguese *Galega* cultivar olive oil by applying a shortened malaxation time, with focus on the extraction yields, physicochemical characteristics and sensory properties, including the main legal quality parameters of extra virgin olive oil.

The olive oil production was carried out at semi-industrial scale (350 kg/h). PEF treatment (2.0 kV/cm; 8.5 kJ/kg; monopolar pulses of 40 µs; 100 Hz) was conducted in continuous mode (flow rate of 2242 kg/h), before malaxation during 30 min at 32.0 ± 0.7 ºC. In parallel, olive oil was produced without PEF application, as a control, with 45 minutes of malaxation at 32.0 ± 0.7 ºC. Olive oil extraction yields, acidity, peroxide value, K_{232}, K_{268}, K_{270}, ΔK, oxidative stability, total polyphenols, tocopherols and tocotrienols content and sensorial analyses were performed.

PEF treatment maintained the same extraction yield while reducing the malaxation time by 33% compared to control sample, resulting in an increased production capacity. In addition, both olive oils produced were classified as extra-virgin by considering the physicochemical and sensory analyses. Acidity and K_{232} values were lower in PEF sample compared to control sample. However, PEF samples showed lower oxidative stability. In conclusion, PEF can be applied in the production of high-quality olive oil *Galega* cultivar, with a positive impact on production efficiency, maintaining the extra-virgin classification.