Co-Extraction of Bioactives from *Rosa canina* Flowers for Oleolite Production Using Supercritical CO_2: Focus on Oxidative Stability Enhancement

A. Premkartikkumar Geethalakshmi, Bolzano/IT, R. Suhag, Bolzano/IT, S. Bolchini, Bolzano/IT, M.C. Tenuta, Bolzano/IT, Z. Sartorelli De Giacometti, Bolzano/IT, G. Ferrentino, Bolzano/IT

Faculty of Agriculture, Environmental and Food Sciences, Free University of Bozen-Bolzano, Piazza Università, 1, Bolzano 39100, Italy

The growing demand for natural antioxidants and clean-label lipid formulations has prompted the development of eco-friendly extraction technologies. In this study, we investigated the co-extraction of bioactive compounds from Rosa canina flowers into sunflower oil using supercritical CO_2 (SC-CO_2) for the formulation of oleolites, with particular focus on enhancing their oxidative stability.

Sunflower oil was employed as a food-grade co-solvent during SC-CO_2 extraction under optimized conditions of pressure, temperature, and extraction time. The resulting oleolites were evaluated for oxidative stability using isothermal calorimetry, and antioxidant activity was assessed through the DPPH radical scavenging assay. The enriched oils were further characterized using supercritical fluid chromatography (SFC) to identify and quantify key bioactive compounds.

The results showed that co-extracted oleolites displayed significantly improved oxidative stability, as evidenced by increased induction times and delayed onset of lipid oxidation. This effect was attributed to the successful transfer of lipophilic antioxidants such as tocopherols and carotenoids from Rosa canina into the oil matrix.

This work demonstrates the potential of SC-CO_2 co-extraction as a green and efficient strategy for producing functional lipid-based systems, offering oxidative protection and bioactive enrichment suitable for nutraceutical, food, and cosmetic applications.