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## **Phytosterol isolation from vegetable oils: Methods and Valorization Potential**

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The European demand for phytosterols (PhS), high-value compounds with hypocholesterolemic, anti-inflammatory and anticarcinogenic properties, is steadily increasing. These compounds are widely used commercially in the pharmaceutical, food, and cosmetic industries.

In Western countries, the average daily intake of PhS from natural sources is 150–440 mg, while vegetarians may consume 1 g/day or more. The European Atherosclerosis Society Consensus Panel specified that a PhS intake of 2 g/day produces a 10 % reduction in low-density lipoprotein (LDL) cholesterol without adverse effects, supporting cardiovascular disease prevention. However, the Western diet is unable to provide an effective dose to achieve a cholesterol-lowering effect. Due to the limited intake of PhS from a typical Western diet and their proven cholesterol-lowering and other health benefits, the isolation of PhS from plant sources is essential to produce fortified foods and supplements that can deliver effective daily doses.

PhS are naturally present in oils from seeds such as sunflower, corn, soybean, olive, and rapeseed. Their concentration and composition depend on the plant source, although refining and processing of the oil can significantly increase their content. Isolation of PhS with high yield and purity from crude oils or refining by-products is a focus of intensive research, with increasing attention on by-products from biofuel production that support circular economy principles.

Our work focuses on the evaluation of vegetable oils through the development of efficient and environmentally friendly processes for the isolation of PhS from oils and refining by-products. Post-fermentation corn oil produced by Envien Group contains about 0.4–2 % PhS in free and esterified forms, making it a promising source for their isolation and efficient valorization of bioethanol by-products. Results suggest that PhS are distributed mainly to side-products from biodiesel production.

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