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Circular Valorization of Mediterranean Olive By-products for Feed, Functional Additives, Sustainable Packaging and Biogas

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Abstract

The olive oil sector is a fundamental pillar of Mediterranean agriculture producing substantial volumes of by-products that remain largely underexploited. To address this challenge, the EU-PRIMA-funded project OLIWA is developing innovative approaches for transforming olive by-products (OPs) into valuable and sustainable resources. OLIWA brings together a multidisciplinary consortium of academic and industrial partners from across the Mediterranean region with the shared goal of demonstrating effective and sustainable valorization pathways for olive waste. Guided by circular economy principles, the project seeks to convert OPs into animal feed ingredients, functional additives, bio-based packaging materials, and renewable energy sources, thereby reducing waste generation and improving resource efficiency throughout agro-food value chains. One of the project's central activities focuses on the bioconversion of OPs through insect farming, particularly using black soldier fly larvae (Hermetia illucens). Olive residues are being evaluated as alternative rearing substrates to support insect production and generate high-quality insect meals suitable for animal nutrition. In addition, OLIWA investigates the recovery of bioactive compounds from OPs rich in polyphenols and triterpenes with potential antioxidant, anti- inflammatory and antimicrobial activities (NE), for their potential application as functional feed additives. NE, insect meals and their association will be tested in vitro to assess their effects on the intestinal barrier, on animal models (mice and guinea pigs) and through in vivo trials in poultry and fish,

trying to enhance the animal gut health and final product quality. The project also develops innovative biodegradable packaging solutions based on olive and insect-derived resources. Olive by-products generated after oil extraction and black soldier fly (BSF) by-products will be valorized to produce flexible films and rigid packaging materials, alone or in combination with biodegradable polymers, for food packaging applications aimed at improving food preservation and quality. Furthermore, the potential for biogas generation from olive by-products and other organic residues is being assessed to maximize energy recovery and further close resource loops within the system. Through these integrated activities, OLIWA aims to demonstrate how olive by- products can be transformed from waste streams into strategic resources. By linking feed, material, and energy applications within a circular framework, the project contributes to the development of more sustainable, resilient, and resource-efficient agro-food systems while providing scalable models for the advancement of the Mediterranean bioeconomy.

Keywords: circular, olive, natural extracts, insect meal, waste

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