# Biovalorization Of Olive Mill Wastewater To Microbial Lipids And Other Products via *Rhodotorula glutinis* Fermentation

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Olive mill wastewater (OMW) is a by-product of olive oil producers in Mediterranean countries. When untreated OMW is released into environment it can have serious negative effects. However, at the same time OMW is rich in organic compounds, which can either be used directly after extraction, or valorized via biocatalytic processes. RHODOLIVE suggests an innovative circular bioeconomy approach for the valorization of this side-stream by treating it with non-conventional yeast and algal strain. The yeast strain accumulates and produces microbial lipids, biophenols and carotenoids, which will subsequently be used for the development of functional food products. Algae are applied to utilize remaining organic compounds.

In order to fulfill the goals of RHODOLIVE, a multidisciplinary approach is adopted, that harmonically utilizes the know-how of different fields. Six different countries are part of the consortium. The partners participating have complementary expertise so that a holistic approach to the valorization of OMW is possible. More specifically, DÜZEN Biological Sciences Research and Development and Production Co. (DÜZEN, Turkey) will provide the know-how of the fermentation of *R. glutinis* in collaboration with Ankara University. A pilot scale bioreactor (30 L) will be installed near the Laleli olive oil company (owned by DÜZEN) in Balikesir to perform the preparative fermentation and the optimization studies. The studies will focus on

several bioproducts, such as lipids, biophenols and carotenoids (β-carotene and luteolin). The National Institute of Chemistry in Slovenia will contribute their expertise in the development of “green” extraction systems for the purification of the aforementioned products from the delivered biomass. University of Kassel (UniKassel, Germany) will use enzymes to transform the isolated phenolics, to improve their organoleptic properties. The final isolated biocompounds and the biomass will be used by Asociación para la Investigación, Desarrollo e Innovación del sector Agroalimentario (AIDISA, Spain), for their implementation in food products. In parallel, to further minimize the environment impact, Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (ENEA, Italy) in collaboration with Leuphana University of Lüneburg (Germany) will identify yeast and algae that can further degrade the effluent of the fermentation. Using proteomic and metabolomic studies novel nutraceutical compounds will be identified from these organisms that will increase the impact of the developed circular bioprocess. In parallel to this ~~value added~~value-added chain, partners at the University of Latvia will provide an insight on the metabolic pathways of *R. glutinis* using metabolic modeling. This study will provide constructive feedback to improve both the fermentation, by identifying the bottlenecks and overcoming them by changing the fermentation parameters, and the strain, by producing (in collaboration with UniKassel) novel improved strains of *R. glutinis* that could later be used to further increase the titer and to establish a sustainable and feasible bioprocess.

Though this integrated treatment of OMW we envision a sustainable and environmentally friendly bioprocess that will provide a competitive niche in food industry. RHODOLIVE will be performed in industrial related environment, using pilot-scale bioreactor, while all the subsequent steps will be in preparative scale. Aim of RHODOLIVE is that in the end of the project a bioprocess is developed that provides industrial synergy and contributes to circular economy and reduction of the carbon footprint of olive mill industries.