

Application of Hydrothermal Treatment for the Optimal Extraction of Phenols from Olive Mill Wastewater in Lesvos Island

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Abstract

A major fraction of Lesvos Island economy is supported by Olive Mills that produce olive oil but at the same time produce significant amounts of Olive Mill Wastewater (OMWW). Overall, more than 50 facilities operate on the island, and their operation varies from less than 1 ton per hour up to 6 tons per hour. The vast majority of these facilities have a 3-phase production process and some of them have a 2-phase production process. OMWW can be a significant source of phenols (if retrieved), and the extraction of phenols can be a very lucrative endeavor. But, molecules in OMWW tend to biologically degrade, and the phenols that are contained in the liquid fraction decrease over time. The University of the Aegean has developed a solar distillation facility that aims to recover phenols from OMWW and has implemented a supporting survey that assessed the operating Olive Mills in Lesvos island. The recovery of phenols has been advanced by means of hydrothermal treatment in a reactor that is installed in the Laboratory of Energy Management. The OMWW underwent hydrothermal treatment for the optimal recovery of phenols (operating temperatures: 160 °C, 180 °C, and 200 °C). On the one hand, the application of hydrothermal treatment optimized the recovery of phenols from OMWW that is stored for more than 15 days due to the secondary production of phenols. Characteristically, more than 7 g/L phenols were retrieved in the final hydrothermal liquid fraction. On the other hand, the application of hydrothermal treatment allowed an increased concentration of phenols in the distillate for the case of extraction via distillation (a study in support of the solar distillation facility). The results showed that the percentage of recovered phenols was more than tripled in respect to conventional distillation, i.e., 2.9 mg/L vs 0.9 mg/L. Overall, hydrothermal carbonization can be a great enhancing application when the scope is to extract phenols from OMWW.

Keywords: Olivemill wastewater, Hydrothermal treatment, Phenols, Hydrochar