

# **Pomegranate peel and orange juice by-product as new biosorbents of phenolic compounds from olive mill wastewaters**

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Olive-mill wastewater (OMW) is a characteristic by-product of olive-oil production and a major environmental problem in the Mediterranean area, because of its high and toxic organic load. Only recently, in relation to the major interest for the natural compounds with biological activities, researchers have began to consider the recovery of polyphenols, as high value compounds, transforming OMW from effluents to raw material with high potential economic value. It was proved that polyphenols are substances with biological activity (antioxidative, antimicrobial etc.), which can be used in numerous applications in the pharmaceutical, cosmetics, and food industries. Many studies on the recovery of polyphenols from OMW are conducted on small scale and several techniques are used individually or in combination. These techniques largely comprise membrane separation, extraction, adsorption, and chromatographic procedures.

Among them, physical adsorption method is generally considered to be the best effective, low cost, and most frequently used method for the removal of phenolic compounds. The most popular and widely used adsorbent material for treatment of OMW is activated carbon. However, the relatively high initial cost and the need for a costly regeneration system make the activated carbon less economically viable as adsorbent. Thus, many researchers have focused their efforts on optimizing adsorption by development of novel low-cost adsorbents with high adsorptive capacity. Application of food waste materials is gradually becoming of great concern, because these wastes are unused resources and can cause serious disposal problems. The purpose of this work is to investigate the efficiency of two food wastes - pomegranate peel and orange juice by-product - as biosorbents for removal of phenolic compounds from OMW.

Orange juice by-product was washed with distilled water, boiled, dried in an oven, and milled, and the powder was passed through standard ASTM sieves. Pomegranate peels were dried in an oven, milled, and used for ultrasound-assisted extraction of phenolic compounds. After extraction, the solid residue of the filtration was dried and passed through sieves. Initially, the equilibrium time was investigated and afterwards, the effects of sorbent mass concentration (1-3 g/100 mL), temperature (20-60 °C), solution's pH (4-7), initial sorbate concentration (50-500 mg/L), and sorbent particle size (classes passed through standard ASTM sieves between DIN 16 and DIN 100) on total phenols uptake were studied in batch experiments. Different adsorption isotherms (Langmuir and Freundlich isotherms) and kinetic models (pseudo-first, pseudo-second-order kinetics and intraparticle diffusion) were used to find out most suitable models describing our experimental findings.