Poster

Energy potential, nutrients, and contaminants of olive mill solid waste

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ABSTRACT

Motivation: Olive oil production is a key activity in the Mediterranean, with Spain as the world's leading producer. The two-phase system generates approximately 4 tons of olive mill solid waste (alpeorujo) for every ton of oil produced. Due to its high organic matter concentration and pollutant potential, its management represents an environmental challenge (Doula et al., 2021). This study aims to characterize different alpeorujo samples, determine their nutrient and toxic content, and evaluate their biochemical methane potential (BMP).

Methods: Six alpeorujo samples were collected from three olive mills in Andalusia, including fresh and stored samples. Chemical Oxygen Demand (COD), total and volatile solids, N-NH_3, C/N ratio, protein, and fat content were analyzed. Elemental composition was determined using ICP, while polyphenols were analyzed by HPLC-DAD. BMP tests were conducted in Erlenmeyer flasks (240 mL) with an inoculum/substrate ratio of 2:1 under anaerobic conditions at 37°C for 20 days. Methane production was measured under standard conditions.

Results: Total COD ranged between 300–400 mg O_2/L, with higher solid concentrations in fresh samples due to sedimentation. Alpeorujo exhibited a high C/N ratio (~30) and low protein content. BMP values ranged from 150 to 350 mL $CH_4 \cdot g\ VS^{-1}$, with higher methane production in stored samples, indicating that prolonged storage improves biodegradability. It was also observed that alpeorujo samples containing high-molecular-weight phenols exhibited greater microbial inhibition (El Gnaoui et al., 2020), resulting in lower methane production.

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