TOWARDS SUSTAINABLE BIOCONVERSION OF LIGNOCELLULOSE: SCREENING OF THE ANTIOXIDANT POTENTIAL OF WASTE STREAMS FROM WHEAT CHAFF PRETREATMENTS

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Abstract

In recent years, many studies have been conducted on bioconversion technologies and processes to utilize lignocellulosic biomass as feedstock for producing bio-based fuels and fine chemicals. Nevertheless, the life cycle assessment of lignocellulosic-derived products rarely considers waste treatment. To overcome the problems coming from waste accumulation and low recycling efficiency, and to enhance economic feasibility, a novel reuse strategy that enables the utilization of all streams from lignocellulose bioconversion should be investigated.

Wheat chaff, an insufficiently exploited and inexpensive lignocellulosic material, was subjected to ultrasonic (US), alkali (AL) or hydrothermal (HT) pretreatments prior to enzymatic conversion to simple sugars. Applied pretreatments induced various changes in physical and/or chemical characteristics of lignocellulose material resulted in the highest and the lowest production of reducing sugars in liquid waste stream - 5.8 mg/mL and 0.68 mg/mL after HT and US, respectively. The antioxidant potential of waste streams generated after all pretreatment was evaluated using the ABTS and DPPH in vitro assays. The results showed that all waste streams exhibited high antioxidant activity. The waste stream generated after alkali pretreatment had the lowest EC50 values assayed by both applied methods indicating its considerable antioxidant potential. The EC50 values were 0.01 mg/mL and 0.03 mg/L, measured by ABTS and DPPH, respectively. The results suggested that the waste streams from the studied pretreatments could be valuable sources of compounds with excellent antioxidant capabilities that could improve the economic and environmental aspects in wheat chaff bioconversion and valorization route in the future.

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