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INSIGHTS INTO PRETREATMENT METHODS FOR BREWERS' SPENT GRAIN VALORIZATION AS A MICROBIAL SUBSTRATE

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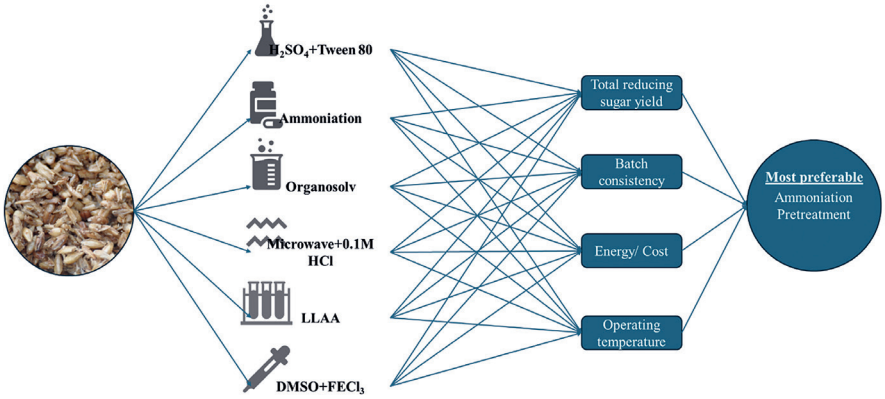
Abstract – Brewers spent grain (BSG), the primary byproduct of the brewing industry has significant potential due to its rich nutrient content, and numerous studies are being conducted on its valorization. Despite the research conducted, enormous quantities of BSG are still disposed of in landfills, causing environmental issues. Researchers have identified that BSG contains the nutritional requirements for growing distinct types of microorganisms; however, due to the high lignin content and complex chemical nature of BSG, assimilation of these nutrients is restricted. Therefore, this study aimed to identify the most suitable pretreatment method for BSG to extract nutrients to obtain a commercially viable, optimal substrate for microorganism cultivation. Six pretreatment methods and their optimal conditions were selected from previous research on BSG and similar lignocellulose biomasses. The pretreatments resulted with average total reducing sugar yields (TRS) as: dilute sulfuric with Tween 80 pretreatment (82.03 mg/g BSG), Ammoniation pretreatment (169.79 mg/g BSG), aqueous ethanol organosolv pretreatment (166.03 mg/g BSG), microwave assisted hydrochloric pretreatment (320.4 mg/g BSG), low liquid aqueous ammonia pretreatment (145.3 mg/g BSG) and ferric (III) catalyzed dimethyl sulfoxide pretreatment (236.81 mg/g BSG). A TOPSIS assessment based on TRS, batch consistency, cost, energy consumption and operating temperature identified Ammoniation pretreatment as the most suitable method for nutrient extraction from BSG to create a commercially viable substrate for microorganism cultivation.

Keywords – Batch consistency; chemical cost; energy consumption; operating temperature; total reducing sugar yield



Evaluation framework for assessing BSG pretreatment methods

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