

**SPENT COFFEE GROUND AS AN ALTERNATIVE OF SOLID
FUELS**

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ABSTRACT

SPENT COFFEE GROUND AS AN ALTERNATIVE SOLID FUELS

This study reviews research conducted from 2020 to 2025 on the feasibility of using spent coffee grounds (SCG) as an alternative solid fuel. The rapid increase in global coffee consumption has resulted in the large-scale production of SCG, a major by-product of the coffee industry that is frequently discarded in landfills, contributing to pollution and greenhouse gas emissions. As the world seeks sustainable and renewable energy sources to reduce dependence on fossil fuels, SCG presents a viable bioenergy alternative due to its high calorific value (20.9 MJ/kg). Several thermochemical conversion methods, such as torrefaction, pyrolysis, and carbonization, have been analysed to enhance SCG's fuel properties. These processes help improve moisture control, combustion efficiency, and energy yield. SCG's environmental benefits include reducing landfill waste, lowering methane emissions, and contributing to carbon-neutral electricity generation. Additionally, SCG-based fuels are evaluated for their economic feasibility, with a focus on cost-effectiveness compared to traditional biomass and fossil fuels. Despite its potential, SCG as a large-scale solid fuel alternative faces challenges such as supply chain irregularities, the lack of standardized processing methods, and insufficient industrial infrastructure. To overcome these issues, this study recommends improving drying efficiency, optimizing briquetting processes, and using HTC for wet SCG. Collaboration between public and private sectors is crucial to support large-scale adoption. Additionally, co-firing SCG with coal in power plants may serve as a transitional strategy for cleaner energy. This research contributes to waste valorisation, circular economy practices, and environmental sustainability, reinforcing SCG's potential as an economically and environmentally viable renewable energy source.