

**HARNESSING THE POTENTIAL OF
SPENT COFFEE GROUNDS (SCG):
A NOVEL APPROACH TO ANTIOXIDANT
CLEANING SOAP**

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ABSTRACT

Spent Coffee Grounds (SCG) is one of the major food wastes produced from coffee production that contains abundance of valuable bioactive compounds. The bioactive compounds found in SCG have drawn attention to antioxidant properties that can be used in many fields of industry. However, improper disposal of SCG can negatively impact the environment if waste management are not effectively implemented. Research on harnessing SCG for high value applications remain limited. The effective utilization of SCG in such applications requires deeper understanding of their chemical composition, antioxidant activity and functional properties. Therefore, this study aimed to extract the SCG by Soxhlet extraction method using ethanol as a solvent, determined the bioactive compounds such as phenolics, flavonoids and saponins from the SCG using bioactive compound analyses and FTIR analysis and formulate a natural cleaning soap using spent coffee grounds extract (SCGE) as antioxidant properties. In this study, the SCGE of 64.87% was obtained using Soxhlet extraction. Total phenolics and flavonoids content of SCGE were quantified using UV-Visible spectroscopy that produced 38.60 ± 0.09 mg GAE/g and 66.38 ± 1.28 mg QE/g respectively. Saponin content was confirmed through a saponin screening test. The antioxidant activity was determined via the DPPH radical scavenging assay that exhibited an IC_{50} value of 36.36 mg/L which indicating strong radical-scavenging potential. Different soap formulations (S1, S2, S3 and S4) incorporating SCG and SCGE were successfully formulated. FTIR analysis confirmed the presence of functional groups associated with antioxidant compounds in the soap formulations. The physicochemical properties including moisture content, foam retention and pH test of the soap's samples were evaluated. The findings demonstrated that all formulations met acceptable quality standards, with moisture content ranging from 6.15% to 12.30%, foam retention stands from 32.15 to 43.54 minutes and pH values within the acceptable range of 8.508 and 9.721. Soap formulation S3 demonstrated the best overall performance compared to other formulations because of beneficial effects of SCG in enhancing foam stability and antioxidant properties. This study highlights the potential of SCG as a sustainable ingredient in soap formulations, with promoting skin care benefits such as antioxidant properties and environmental sustainability by repurposing coffee waste. Further research is recommended to optimize extraction methods an evaluate additional bioactive compounds for enhanced applications in products incorporating SCG.