

# Valorisation of Spent Coffee Grounds: Comparing Phenolic Content and Antioxidant Activity in Solid-Liquid vs. Subcritical Water Extraction Methods

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## INTRODUCTION & AIM

The agrifood industries generate tremendous amounts of waste. Spent coffee grounds (SCG) have an estimated annual production of 6 million tons worldwide<sup>[1]</sup>. Here, the antioxidant activity of SCG extracted by two different methods, solid-liquid extraction (SLE) and subcritical water extraction (SWE) was assessed.

## METHOD



## 1. Extraction of phenolic compounds

### SLE extractions:

Extract A (1g:50 mL 50:50 H<sub>2</sub>O:MeOH, 1h, 40 °C)

Extract B (1g:100 mL 50:50 H<sub>2</sub>O:MeOH, 1h, 60 °C)

### SWE extractions:

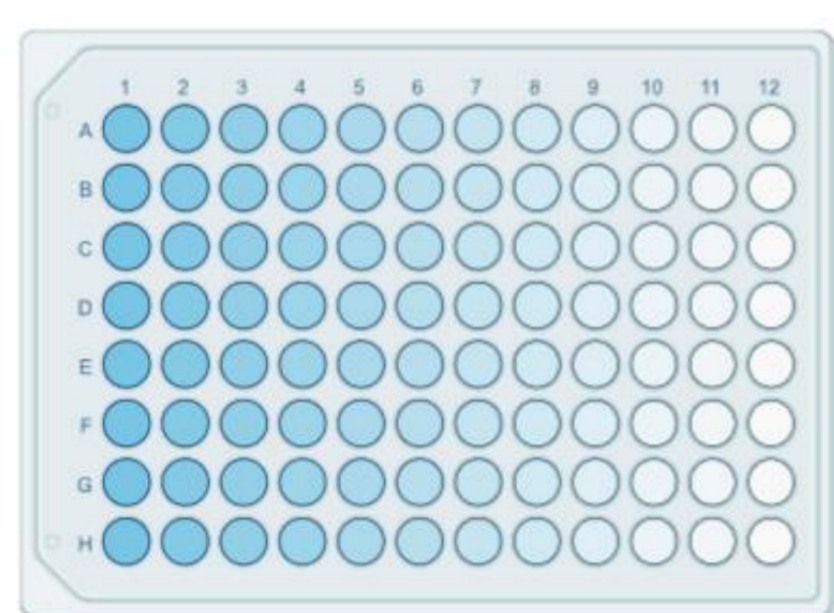
Extract A (2 g:200 mL H<sub>2</sub>O, 60 bar 100 °C)

Extract B (2 g:200 mL H<sub>2</sub>O, 60 bar, 150 °C)

## 2. Antioxidant activity assays

### ABTS<sup>•+</sup>

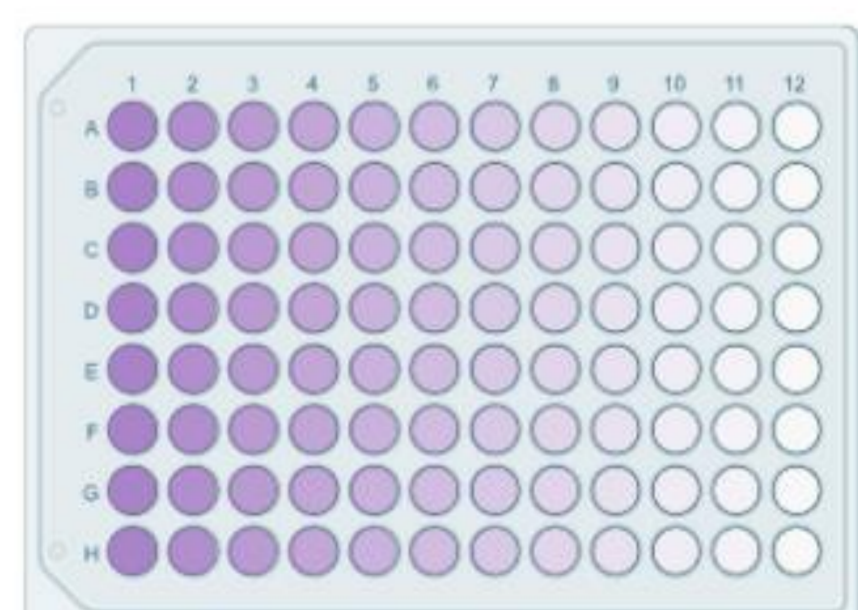
- 20 µL sample
- 180 µL ABTS<sup>•+</sup> solution
- 6 min incubation
- Reading at 734 nm



### FRAP

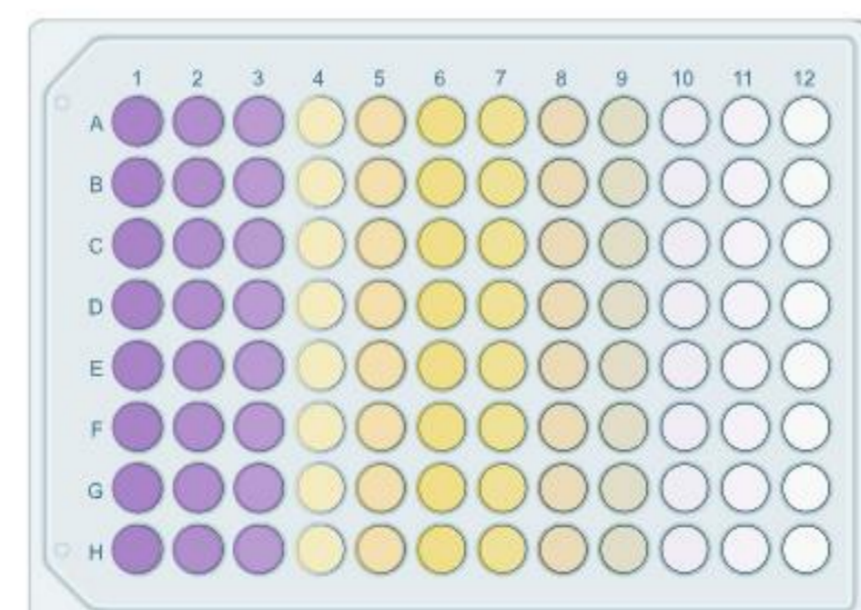
- 20 µL sample
- 180 µL FRAP reagent
- 4 min incubation
- Reading at 593 nm

### TPC



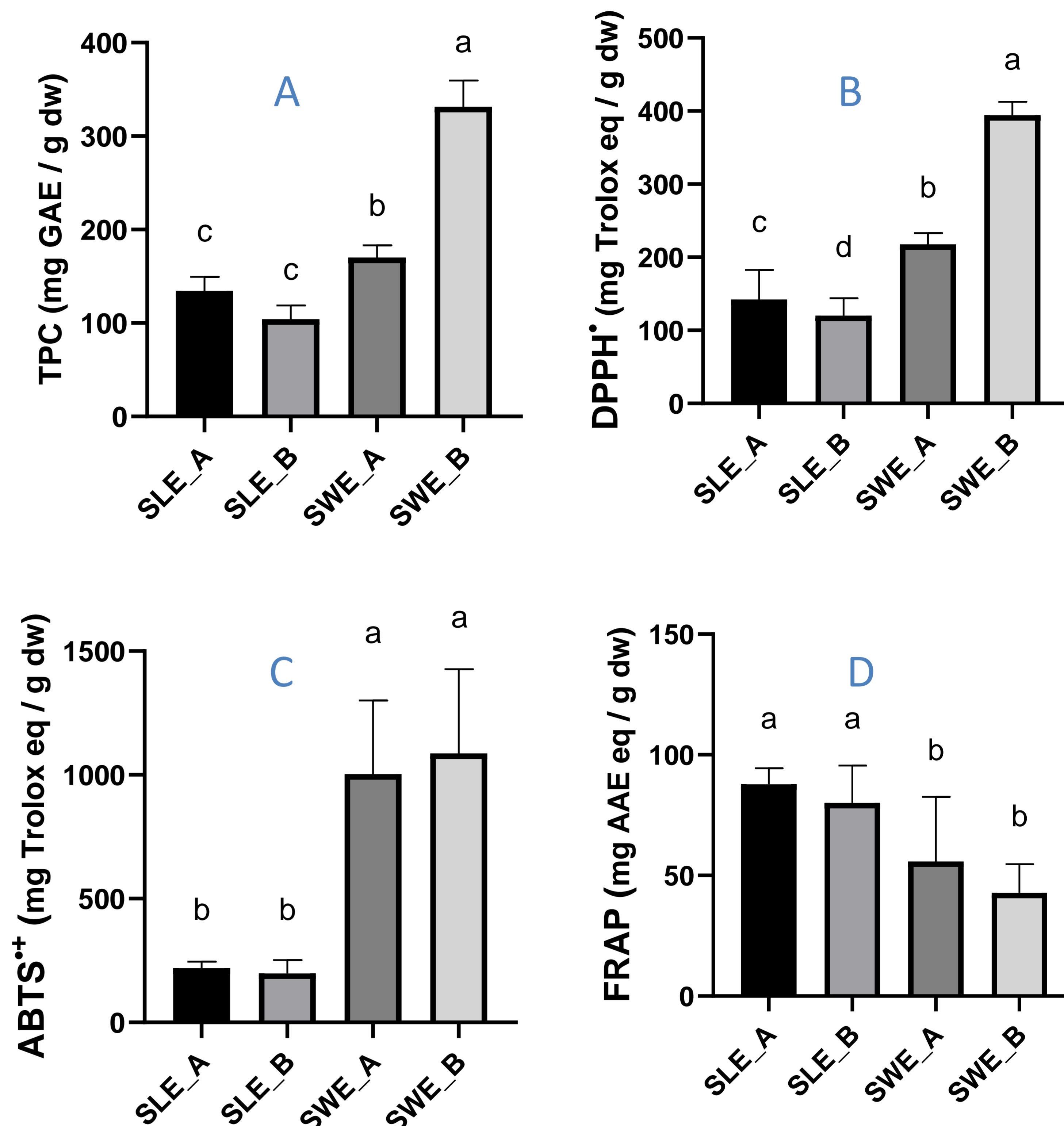
- 25 µL sample
- 25 µL Folin-Ciocalteu reagent
- 75 µL ultrapure water
- 100 µL Na<sub>2</sub>CO<sub>3</sub>
- 90 min incubation
- Reading at 765 nm

### DPPH<sup>•</sup>



- 25 µL sample
- 200 µL ethanolic solution of DPPH<sup>•</sup>
- 30 min incubation
- Reading at 517 nm

## RESULTS & DISCUSSION



**Figure 1** – TPC (A), DPPH<sup>•</sup> (B), ABTS<sup>•+</sup> (C), and FRAP (D) results for all extracts. Extracts were compared by ANOVA using Tukey post hoc test and different letters correspond to statistically significant differences at p<0.05.

SWE extraction displays higher phenolic content, along with radical scavenging activity against DPPH<sup>•</sup> and ABTS<sup>•+</sup>. SLE extracts displays higher ferric reducing power.

## CONCLUSION

The extraction method highly influences the characteristics of the produced extract. This work allows for a better understanding of the phenolic content and antioxidant capabilities of SCG extracts.

## REFERENCES

[1] - Zhao, N., Liu, Z., Yu, T., & Yan, F. (2024). Spent coffee grounds: Present and future of environmentally friendly applications in industries-A review. *Trends in Food Science & Technology*, 143, 104312. <https://doi.org/10.1016/j.tifs.2023.104312>

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