

VALORIZATION OF DEFECTIVE GREEN COFFEE BEANS THROUGH PILOT-SCALE EXTRACTION: PHENOLIC AND NUTRITIONAL COMPOSITION OF CONCENTRATED EXTRACTS

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Introduction

Green coffee beans with high defect scores, while commercially valuable, are typically classified below specialty-grade coffees and underutilized in the development of value-added ingredients. This study focused on the analytical characterization of phenolic profiles in extracts from *Coffea arabica* (26% defective beans including black and green/immature, 2021/2022 harvest, Minasul Cooperative, Varginha, Brazil) using high-performance liquid chromatography with diode array detection (HPLC-DAD), following pilot-scale extraction.

Materials/Methods

The pilot-scale extraction involved 500 g of ground beans (0.5 – 1.0 mm particle size) mixed with 10 L of 50% (v/v) ethanol–water solution at a 1:20 m/v ratio. The mixture was heated at 55-65 °C under vacuum (520 mmHg) in a steam jacketed kettle (Mecamau, Brazil) with continuous agitation for 60 minutes, and then filtered through 18 mesh, reaching 3.09% of total solids. The extraction was performed in triplicate.

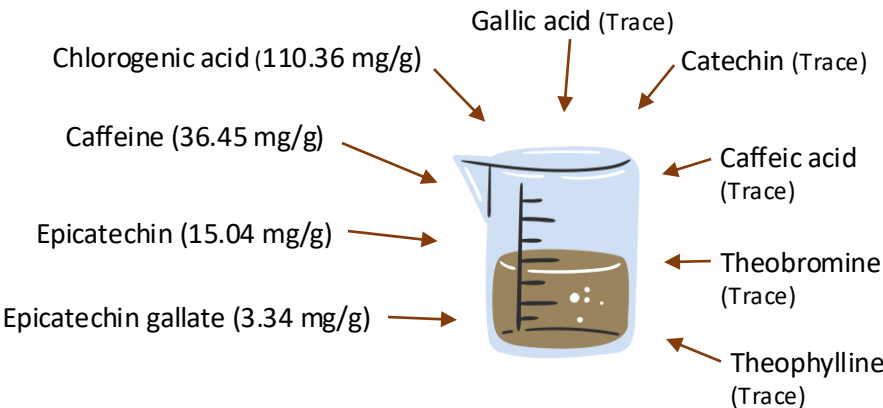


Figure 1: Phenolic compounds in the lyophilized coffee extract showed by HPLC-DAD analysis

Results/Discussion

The energy value was 446 kcal/100 g. The extract had a pH of 6.04, water activity of 0.557, and displayed a moderately bright yellow-brown coloration (L^* 56.57 ± 1.23; a^* 1.14 ± 0.18; b^* 19.84 ± 0.68).



Figure 2: Coffea beans defective

Conclusion

These findings highlight the potential of lower-grade green coffee beans as sources of phenolic-rich extracts. The analytical stability of key bioactive compounds reinforces the feasibility of their application in functional ingredient development for food and beverage innovations.

References:

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