

Brewed for Skin: From Coffee Waste to Sustainable Self-care

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INTRODUCTION

Coffee is one of the most popular non-alcoholic beverages in the world, with **2-3 billion cups** drunk every day. While prized for its flavor and aroma, coffee production generates substantial waste in form of **spent coffee grounds (SCG)** that impacts the environment.

1 cup of coffee → 8 g of SCG
1 kg of instant coffee → 2 kg of SCG

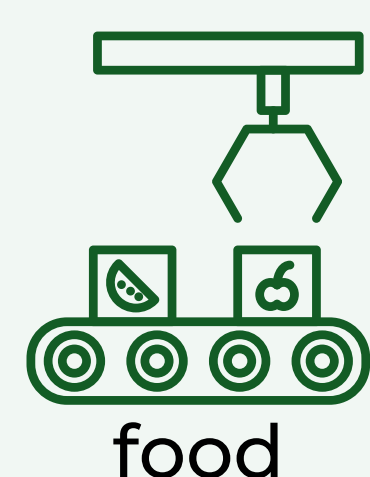
Often discarded as waste, SCG is a valuable by-product with rich composition, including **10-20% lipids**, and various potential uses:



biofuels



cosmetics



food

OBJECTIVES

The aim of this study was to **extract oil** from **spent coffee grounds** and to assess its potential for cosmetic applications by analyzing its properties. Since coffee is **rich in bioactive compounds**, such as polyphenols, melanoidins, and others, the obtained SCG oil was tested for **antioxidant activity**. In addition its **cytotoxicity** was evaluated to ensure **safety** in cosmetic applications.

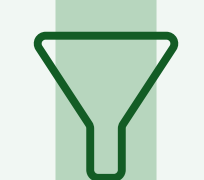


METHODS

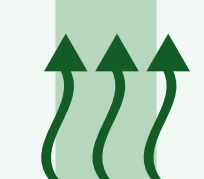
OIL EXTRACTION



extraction with hexane



filtration of lipid-free spent coffee grounds



solvent evaporation and recovery for the next extraction

ANTIOXIDANT ACTIVITY EVALUATION



triple extraction of antioxidants with methanol



antioxidants assays - ABTS, CUPRAC, FRAP, TPC

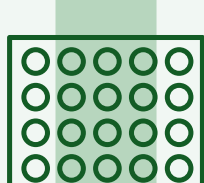


data analysis

SAFETY ASSESSMENT



treatment of HaCaT cells with the tested oil in Ac/EtOAc



cytotoxicity tests - MTT, FDA/PI

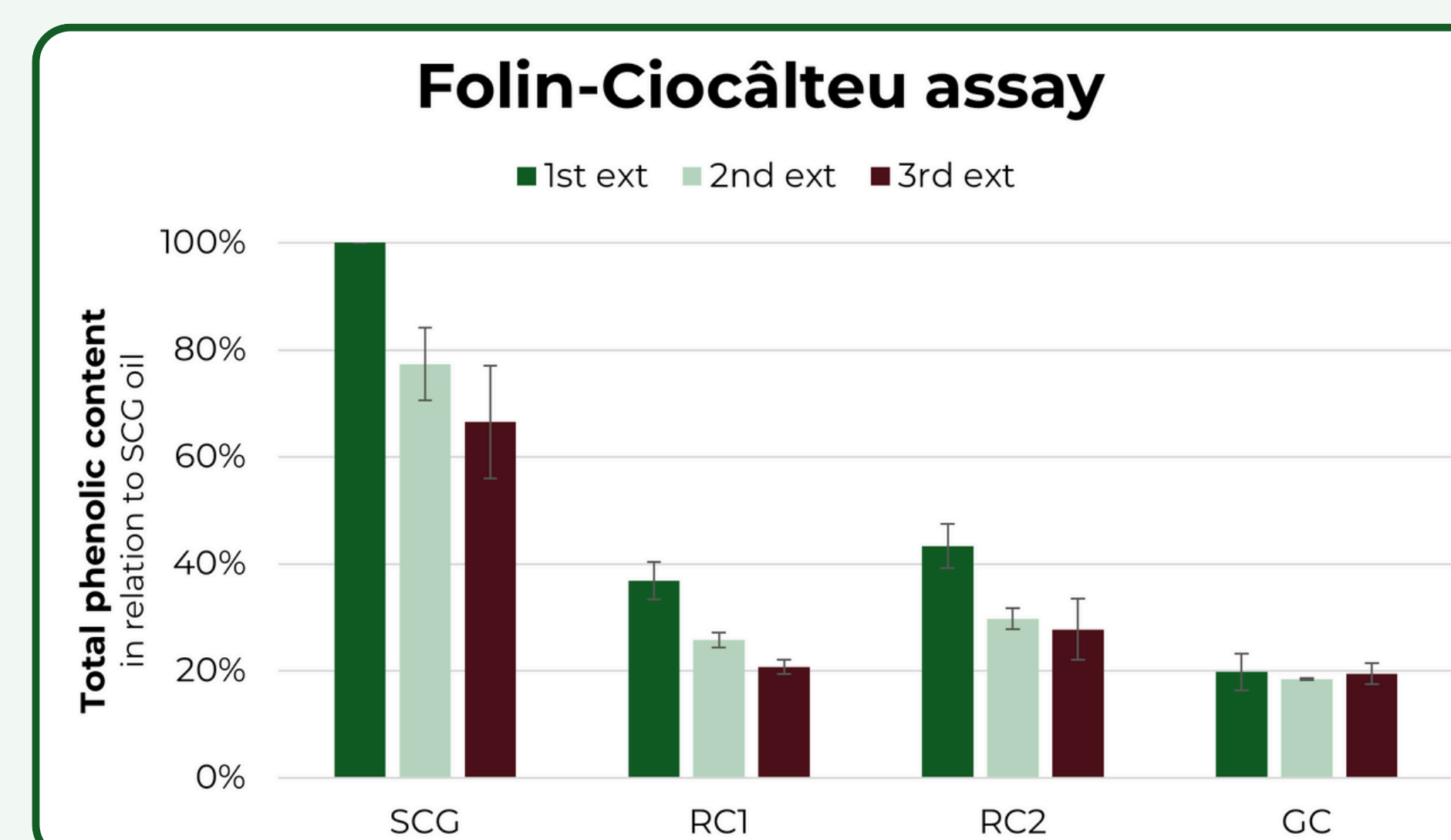
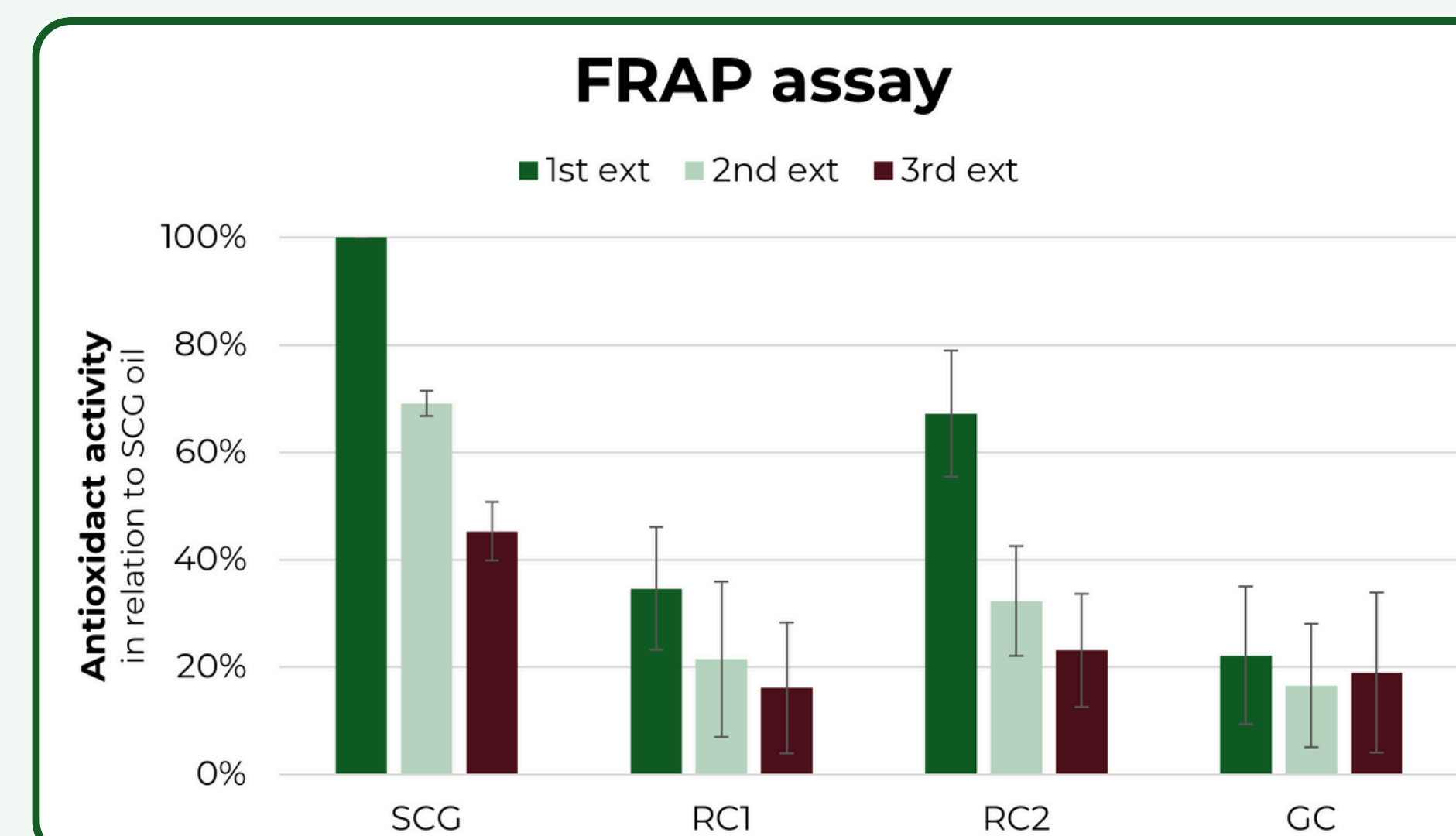


data analysis

RESULTS

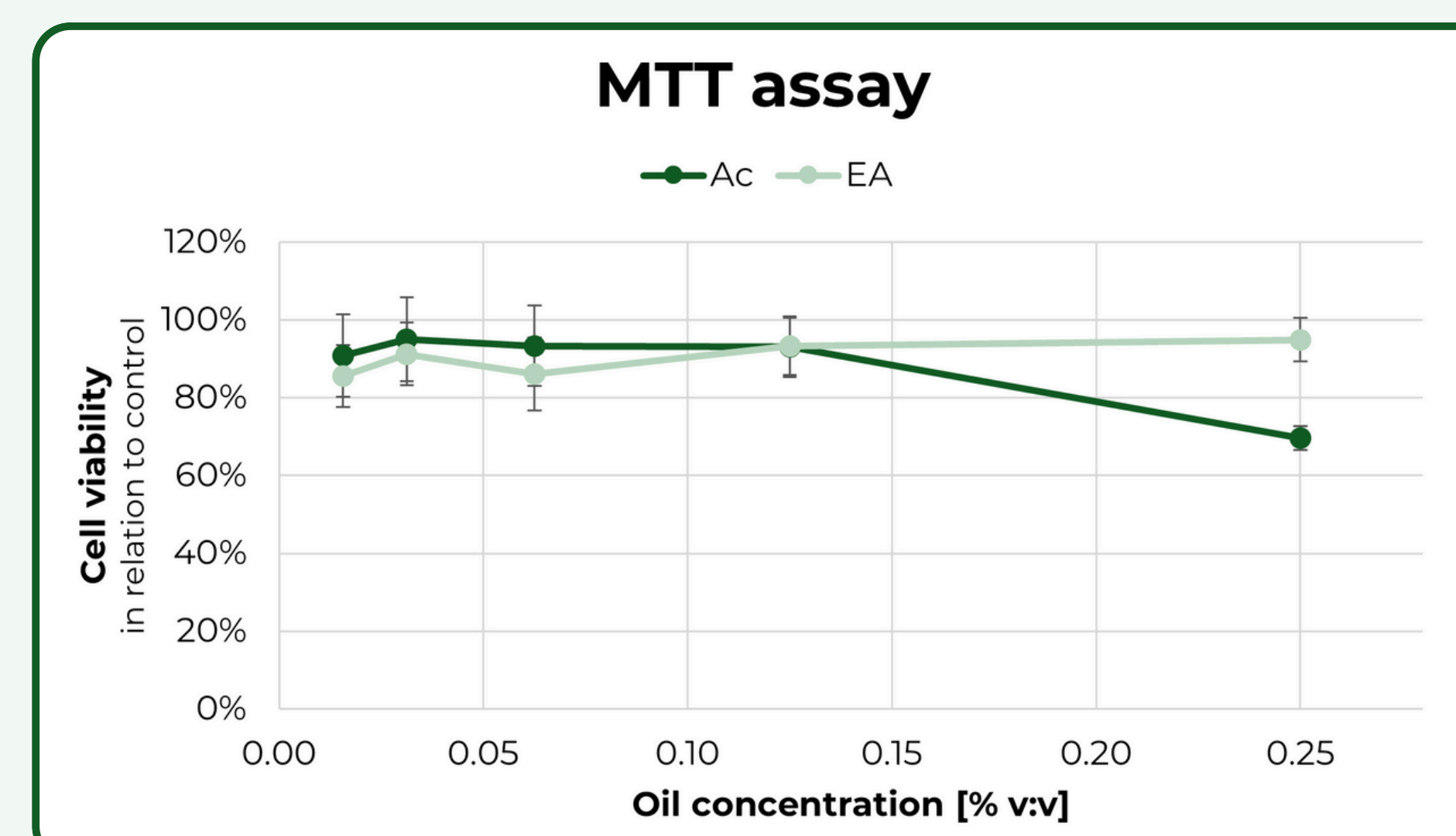
ANTIOXIDANT ACTIVITY

To highlight the **high antioxidant activity**, comparative tests were conducted against conventional coffee oils **pressed from roasted and green coffee beans** (RC1, RC2 and GC). All results are expressed relative to the first extraction from SCG oil, used as a reference for the other oils.



SAFETY OF USE

Cytotoxicity of coffee oil at different concentrations (from 0,02% to 0,25% in acetone (Ac) or ethyl acetate (EA)) was evaluated by the **MTT assay** in **human HaCaT keratinocytes**. Results are shown relative to the control (cells treated with solvent).



CONCLUSION

- Spent coffee grounds are a rich source of **unique compounds** with **potential for reuse**
- Oil extracted from SCG contains numerous bioactive substances, including **antioxidants**, with levels up to **five times higher** than in conventional coffee oils
- Cytotoxicity studies show **no negative effects** on human skin cells, supporting its safe use in the cosmetics
- Using SCG oil promotes a **circular green economy**



Stay connected!
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Detailed results are available in our article
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Scan QR code to read the publication

