Dipartimento di Farmacia

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PROJECT TITLE

Sustainable Recovery of Bioactive Compounds from Spent Coffee Grounds and Their Characterization for Nutraceutical and Cosmetic Applications

Project description (272 words)

The valorization of agri-food waste represents a major challenge for environmental protection and principles of the circular economy [1]. Coffee, one of the most widely consumed beverages worldwide, generates enormous quantities of by-products every year. Spent coffee grounds constitute a waste biomass, often discharged as organic waste, despite still containing high-value compounds such as polyphenols, chlorogenic acids, caffeine, terpenes, and fatty acids [2].
This project proposes the qualitative and quantitative physicochemical characterization of extracts obtained through "green" technologies, such as supercritical CO_2 extraction, using both conventional analytical techniques (HPLC-DAD, LC-MS/MS, GC-MS) and advanced techniques, such as two-dimensional chromatography (2D-LC). The objective of the characterization will be to assess the recovery of bioactives, while also investigating the possible presence of contaminants [3].
In addition, the ability of the recovered bioactives to permeate biological membranes will be evaluated using biochromatography, a technique that employs stationary phases containing immobilized membrane phospholipids, as well as proteic stationary phases such as human serum albumin (HSA), to assess biodistribution-related properties.Subsequently, the extracts showing the most promising chemical profiles will undergo in vitro biological evaluation. Cell viability assays will be performed to assess the safety and biological effectiveness of the extracts, along with on their antioxidant and cytoprotective activities, in order to assess their potential application in nutraceutical and cosmetic formulations.
The project will generate develop new scientific knowledge regarding the valorization processes of spent coffee grounds, contributing to the reduction of organic waste and the promotion of circular economy models. From an applicative and industrial perspective, the results obtained may support the development of new active natural ingredients with high commercial value for the nutraceutical and cosmetic sectors

REFERENCES

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