Valorisation of chestnut shells as a prominent sustainable ingredient for cosmetics

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The demand for novel active ingredients for cosmetic purposes, mainly recovered from natural sources, has raised in the last decade owing to society's awareness of sustainability issues and the importance of skin appearance. Food by-products arise as promising alternatives to obtain eco-friendly cosmetic ingredients with high added value [1]. Chestnut shells, an abundant and undervalued agro-industrial waste generated during chestnut (Castanea sativa) processing, are particularly rich in bioactive compounds, such as polyphenols and vitamin E, endowed with pro-healthy skin effects [1-3].

The purpose of this study was to recover bioactive compounds from chestnut shells using clean and proficient technology, namely ultrasound-assisted extraction (UAE). The phenolic composition of the extract prepared at 70 °C for 40 min was evaluated by LC-MS, while the antioxidant/antiradical and antimicrobial activities, as well as elastase and hyaluronidase inhibitory effects, were assessed by in-vitro assays. The safety on skin cell lines (HaCaT and HT29-MTX) was assessed by an MTT assay (0.1 – 1000 μg/mL).

The chestnut shells extract revealed to be rich in ellagic acid, caffeic acid derivative, and epigallocatechin. These compounds were probably responsible for the high antioxidant, antiradical, and antimicrobial effects observed. The outcomes disclosed pronounced antibacterial effects against Staphylococcus aureus, Klebsiella pneumoniae, and Escherichia coli strains. The elastase inhibition was 74.8% at 0.4 mg/mL, while the IC50 from the hyaluronidase assay was 760 μg/mL. The safety of the extract was proved on HaCaT and HFF-1 cells up to 1000 μg/mL (viability >70%). Overall, these findings pointed out that the chestnut shells extract is an appealing source of bioactive compounds with promissory in-vivo skin effects, such as anti-wrinkles. Noteworthy, further studies should be performed to assess the ex vivo permeation of the bioactive compounds through Franz diffusion cells coupled to human skin as well as the assessment of the extract safety in human volunteers by in vivo patch test.

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