



EVALUATION OF ETHANOLIC EXTRACTS FROM *Lafoensia replicata* FOR PHOTOPROTECTIVE USE IN COSMETICS: A MULTIVARIATE CHEMICAL AND METABOLOMIC APPROACH

**Débora Machado de Lima**<sup>1\*</sup>, Tiara da Costa Silva<sup>2,3</sup>, Mário Machado Martins<sup>2</sup>, João Flávio da Silveira Petrucci<sup>1</sup>, Raquel Maria Ferreira de Sousa<sup>1</sup>

\*deboramalima@gmail.com

1-Instituto de Química, UFU, CEP 38400-902, Uberlândia, MG, Brazil. 2-Instituto de Biotecnologia, UFU, 38405-319, Uberlândia, MG, Brazil. 3-Instituto de Ciências Exatas, Naturais e Educação, UFTM, 38025-440, Uberaba, MG, Brazil.

The demand for effective and safe natural ingredients for cosmetic formulations has encouraged the investigation of plants rich in bioactive metabolites. *Lafoensia replicata*, a native species of the Cerrado, has already demonstrated significant antioxidant and antimicrobial activities and is mainly composed of flavonoids, phenolic acids, and especially tannins. In this study, the potential of ethanolic extracts of *L. replicata* to be used as a photoprotective ingredient in cosmetic formulations was investigated. Five leaf extracts were prepared by maceration using ethanol/water mixtures at concentrations of 20, 40, 60, 80, and 96%. Six replicates of each extract were submitted to (i) chemical analysis, including total phenolic content, DPPH assay, flavonoid levels, condensed and hydrolysable tannins, (ii) spectrophotometric measurements for Sun Protective Factor (SPF) determination using the Mansur method; (iii) mass spectrometry experiments to assess chemical composition; and (iv) multivariate analysis. Principal Component Analysis (PCA), based on the chemical analysis and SPF data, showed that the extracts obtained with 20 and 96% of ethanol formed distinct clusters, while the other extracts (40, 60 and 80% ethanol) were grouped within the same cluster. Hydrolysable tannins appeared as the most important feature for the extract discrimination, with the highest level found in the 20% ethanolic extract. Additionally, an untargeted metabolomic analysis of the extracts was carried out using liquid chromatography/electrospray ionization time-of-flight mass spectrometry (LC-ESI-QTOF) and molecular feature extraction (MFE). Eight compounds with a high molecular mass and a structure compatible with tannins were identified. Cosmetic formulations were developed using 20% and 96% ethanolic extracts, and the SPF was evaluated. A commercial sunscreen was used as a positive control. All of the samples had an SPF of 30, and the *t*-test revealed no statistically significant differences between them (95% confidence interval). These findings reinforce the potential of *L. replicata* as a source of bioactive compounds for natural cosmetic formulations. Moreover, the results suggest that the photoprotective effect was not significantly affected by solvent concentration, indicating the feasibility of using lower concentrations of solvent - an important environmental advantage. Acknowledgments: FAPEMIG, CAPES and CNPq.

**Keywords:** tannins, natural cosmetics, protective factor

