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Caffeic Acid in Cosmetic Formulations: An Innovative Assessment

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Abstract : Phenolic compounds are abundant in the Brazilian plant kingdom and they are part of a large and complex group of organic substances. Cinnamic acids are part of this group of organic compounds, and caffeic acid (CA) is one of its representatives. Antioxidants are compounds which act as free radical scavengers and, in other cases, such as metal chelators, both in the initiation stage and the propagation of oxidative process. The tyrosinase, polyphenol oxidase, is an enzyme that acts at various stages of melanin biosynthesis within the melanocytes and is considered a key molecule in this process. Some phenolic compounds exhibit inhibitory effects on melanogenesis by inhibiting the tyrosinase enzymatic activity and therefore has been the subject of studies. However, few studies have reported the effectiveness of these products and their safety. Objectives: To assess the inhibitory activity of tyrosinase, the antioxidant activity of CA and its cytotoxic potential. The method to evaluate the inhibitory activity of tyrosinase aims to assess the reduction transformation of L-dopa into dopaquinone reactions catalyzed by the enzyme. For evaluating the antioxidant activity was used the analytical methodology of DPPH radical inhibition. The cytotoxicity evaluation was carried out using the MTT method (3-(4,5-dimethyl-2-thiazolyl)-2,5-diphenyl-2H-tetrazolium bromide), a colorimetric assay which determines the amount of insoluble violet crystals formed by the reduction of MTT in the mitochondria of living cells. Based on the results obtained during the study, CA has low activity as a depigmenting agent. However, it is a more potent antioxidant than ascorbic acid (AA), since a lower amount of CA is sufficient to inhibit 50% of DPPH radical. The results are promising since CA concentration that promoted 50% toxicity in HepG2 cells (IC50=781.8 µg/mL) is approximately 330 to 400 times greater than the concentration required to inhibit 50% of DPPH (IC50 DPPH= 2.39 µg/mL) and ABTS (IC50 ABTS= 1.96 µg/mL) radicals scavenging activity, respectively. The maximum concentration of caffeic acid tested (1140 mg /mL) did not reach 50% of cell death in HaCat cells. Thus, it was concluded that the caffeic acid does not cause toxicity in HepG2 and HaCat cells in the concentrations required to promote antioxidant activity in vitro, and it can be applied in topical products.

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