Unlocking Nature's Shield: Elderberry Hydrosol's Antigenotoxicological and Antioxidant Potential for Sustainable Skincare

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Elderberry (*Sambucus nigra*) has garnered attention for its rich content of beneficial phytochemicals and its diverse applications in traditional medicine. Recently, elderberry hydrosol has emerged as a promising ingredient and holds potential as a valuable resource for various applications, including cosmetics, aromatherapy, and possibly as a functional ingredient in dietary supplements. This study aims to assess the antigenotoxic and antioxidant properties of elderberry hydrosol. The methodology involved domestic hydrodistillation to obtain elderberry hydrosol. Four concentrations (1%, 5%, 10%, and 15% w/v) of elderberry hydrosol were used to assess the antigenotoxic potential in human peripheral blood mononuclear cells after exposure to hydrogen peroxide. We evaluated DNA damage in these cells using the Comet assay to determine its protective effects against DNA damage. Antioxidant assays, including ABTS (2,2′-azinobis(3-ethylbenzothiazoline-6-sulfonic acid)) and DPPH (2,2-Diphenyl-1-picrylhydrazyl), were employed to elucidate its antioxidative potential. The hydrodistillation process produced elderberry hydrosol, demonstrating a significant transfer of aromatic and therapeutic compounds, emphasizing its effectiveness and environmentally friendly characteristics. The genotoxicity assessments revealed the hydrosol's ability to protect against DNA damage at all concentrations tested. Notably, the 1% treatment exhibited the least DNA damage, with 3.7% DNA in the tail, indicating optimal efficacy at this concentration. Furthermore, the ABTS and DPPH assays showed concentration-dependent responses, with higher concentrations correlating with increased antioxidant potency. The highest antioxidant activity was observed at a hydrosol concentration of 15%, corresponding to 0.4 µmol and 0.03 µmol TEAC for ABTS and DPPH, respectively. Elderberry hydrosol is a promising and versatile component for skincare formulations. It provides various benefits and effectively counters DNA damage induced by ROS. Its efficacy and eco-friendly nature make it a valuable addition to natural cosmetic products. Nevertheless, continuous research into its bioactive constituents and mechanisms is essential to harness its potential and promote sustainable skincare practices.

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