

Antioxidant, anti-inflammatory, and antibacterial activities of pomegranate peel and tomato skin extracts in Human Primary Gingival Epithelial Cells.

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Agricultural food waste and by-products boast a wealth of high-added-value compounds that positively affect human health. Thus, the waste matrices hold great promise as a source of active ingredients to be included in nutraceutical and cosmeceutical products, benefiting both human and environmental health. This study explores the biological activities of tomato skin (T) and pomegranate peel (P) extracts on oral mucosa to evaluate their possible use in mouthwash formulations. The biological activities of extracts at different concentrations [0.5%-3%] and a mouthwash formulation (F) containing both extracts at 3% were evaluated in Human Primary Gingival Epithelial cells (GECs). Once ensure safety, the antioxidant and anti-inflammatory activities were analyzed by a cell-based chemiluminescent assay for detecting intracellular H₂O₂ production and real-time PCR, in GECs injured with lipopolysaccharide [25µg/ml]. After 24 h of treatment with T,P, and F, a significant antioxidant activity (IC₅₀P:0.51±0.01µg/mL; IC₅₀T:0.57±0.02µg/mL, IC₅₀F:0.04±0.02µg/mL) and an increased Superoxide Dismutase-1 expression (p< 0,0001) were observed. Additionally, the extracts significantly reduced the expression of Tumor Necrosis Factor α (p< 0,001) and Monocyte Chemoattractant Protein-1 (p< 0,0001), suggesting an anti-inflammatory role. Lastly, the antibacterial activity was assessed against *S. mutans* and *S. sanguinis* by broth microdilution method and agar diffusion test for the extracts and the mouthwash, respectively. These treatments evidenced an antibacterial activity on the reference strains (MICP,T=10% ϕ F=24±1mm for *S.mutans* and MICP,T=5% ϕ F=18±1mm for *S.sanguinis*). Results show the beneficial effects of tomato skin and pomegranate peel in mitigating oxidative stress, inflammation, and bacterial plaque within the oral mucosa, and emphasize the potential of upcycling in promoting human and environmental health. This work was supported by MIUR-PRIN 2022 (Prot. 2022LW54KC) to SH,CC,AP.