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Integrative Evaluation of *Punica granatum* Peel Aqueous Extract: From Molecular Docking to Gel Formulation and Biological Activities

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Abstract

This study investigated the physicochemical and biological properties of an aqueous extract from *Punica granatum* peel (WPG) and, for the first time, its incorporation into hydrogel formulations for dermocosmetic applications. The extract was characterized for its total phenolic and flavonoid contents, antioxidant activity (DPPH and ABTS assays), and inhibitory effects on tyrosinase and elastase enzymes. Its antimicrobial activity was evaluated against eight pathogenic strains using the inhibition zones diameters, minimum inhibitory concentration (MIC) and the minimum bactericidal concentration (MBC) assays. In silico molecular docking of minralasin and pranatin was performed to support the in vitro findings. Notably, demonstrating a novel approach to formulations. The hydrogel formulations were then assessed for physicochemical stability, microbiological safety, and cytocompatibility. WPG exhibited high phenolic (116.5 mg GAE/g extract) and flavonoid (20.6 mg QE/g extract) contents, strong

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Protective effect of blemish balm cream containing flesh of Salak Pondoh (*Salacca zalacca* [Gaert.] Voss) fruit extract against ultraviolet B-induced photoaging

Wahyu Widawati^{A,*}, Dani Dani^B, Vera Vera^A, Fadhilah Haifa Zahiroh^B

Authors and Affiliations >

Tzu Chi Medical Journal 38(3):p 340-349, Jul-Sep 2026. DOI: 10.4103/tcmj.TCMJ-D-25-00056

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Abstract

ABSTRACT

Objectives:

Ultraviolet (UV) light, particularly ultraviolet B (UVB), is a major external factor that accelerates skin aging by generating reactive oxygen species (ROS), which damage skin cells and biological molecules. The flesh of snake fruit (*Salacca zalacca*) contains compounds that may help neutralize ROS and protect the skin from premature aging. This research investigates the protective effects of a Blemish Balm (BB) cream formulated with *S. zalacca* fruit extract against UVB-induced photoaging.

Materials and Methods:

S. zalacca flesh extract (SFE) was formulated with various ingredients, resulting in the BB cream containing SFE (BBSFE). Antioxidant and antiaging *in vitro* assays were measured by H₂O₂ scavenging, ferric reducing antioxidant power (FRAP), collagenase, and tyrosinase inhibition activities on SFE and BBSFE. Male mice (*Mus musculus* L.) were used as a UVB-induced photoaging model by shaving the dorsal skin and exposing it to UVB irradiation twice daily for 14 days, except for the negative control.

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Abstract

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