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**Guava (*Psidium guajava* L.) leaves as a source of phytochemicals with antioxidant, antimicrobial and photoprotective properties for sunscreen formulations**

D. D. D. H. Dewage<sup>1\*</sup>, S. H. S. Karunaratne<sup>2</sup> and C. S. K. Rajapakse<sup>1</sup>

<sup>1</sup>Department of Chemistry, University of Kelaniya, Sri Lanka.

<sup>2</sup>Industrial Technology Institute, Colombo 07, Sri Lanka.

dewagedarshani@gmail.com\*

The skin is the largest and most visible organ of the human body, which acts as the outer protective barrier. Exposure to solar radiation, including UV A and UV B can cause UV induced skin damage leading to sunburn and skin carcinogenesis. Sunscreens with natural ingredients for skin care have become a new trend in cosmetology as they protect skin against photo ageing and dermatologic disorders. Plant parts of guava are known to be rich in phytochemicals with antidiarrheal, anti-diabetic, antimicrobial, hepatoprotective, analgesic and antihyperglycemic activities, but less research has been conducted to explore their photoprotective properties and potential to be used in sun protection cosmeceuticals. Therefore, this study aimed to evaluate the antioxidant, antimicrobial and photoprotective properties of methanolic extract of guava (*Psidium guajava* L.) leaves to investigate its potential to be used in sunscreen formulations. Chemical constituents in guava leaves extracted into methanol by Soxhlet extraction were sequentially fractionated with hexane, dichloromethane (DCM), and aqueous methanol. Each fraction was tested for their bioactivities. The antioxidant activity of each fraction was determined by  $\alpha$ ,  $\alpha$ -diphenyl- $\beta$ -picrylhydrazyl (DPPH) free radical scavenging assay, hydrogen peroxide scavenging assay and ferric ion reducing antioxidant power assay (FRAP). Agar well diffusion method was used to determine the antimicrobial activity against the potential pathogens in cosmetics, bacterial strains of *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 9027), *Staphylococcus aureus* (ATCC 25923) and a fungal strain *Candida albicans* (ATCC 10231). Mansur equation was used to estimate the sun protection factor (SPF) of each fraction by *in-vitro* method using UV spectrophotometry. Among the fractions, aqueous methanol fraction exhibited the highest DPPH free radical scavenging activity with IC<sub>50</sub> value of  $90.07 \pm 0.73$   $\mu$ g/mL and H<sub>2</sub>O<sub>2</sub> scavenging activity with EC<sub>50</sub> value of  $12.65 \pm 1.01$   $\mu$ g/mL. The ferric ion reducing ability of aqueous methanol fraction also was found to be the highest ( $247.0 \pm 0.51$  mg of Ascorbic acid equivalents/mL of extract) among the three fractions. Aqueous methanol fraction showed an antimicrobial activity against all the tested microorganisms and its activity was comparable (zone of inhibition of  $20.0 \pm 0.75$  mm) to that of the positive control Amoxicillin (zone of inhibition of  $22.0 \pm 1.00$  mm) against *Pseudomonas aeruginosa*. The aqueous methanol fraction had an impressive SPF value of  $41.51 \pm 0.64$  which was higher than that of the reference sunscreen (SPF =  $39.18 \pm 0.56$ ). As the results revealed among the tested fractions, the aqueous methanol fraction is the richest in phytochemicals with antioxidant, antimicrobial activities, and photoprotective properties with a high sun protection factor and guava leaves can be used as a natural source of these phytochemicals for the development of sun protection cosmetics.

**Keywords:** Antimicrobial, Antioxidant, DPPH, FRAP, SPF

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