

ABSTRACT

*Exposure to ultraviolet (UV) radiation induces the formation of free radicals that damage skin cells, leading to premature aging and an increased risk of chronic skin disorders. Although chemical and physical sunscreens are widely used, they still have limitations, including the potential for skin irritation, systemic absorption, environmental impact, and aesthetic drawbacks such as a white cast. Therefore, the development of safer and more environmentally friendly natural sunscreen products is needed. Lime peel (*Citrus aurantiifolia*) contains flavonoids, alkaloids, tannins, and saponins with antioxidant activity, indicating its potential as a natural sunscreen agent.*

This study aimed to formulate a spray gel sunscreen containing ethanol extract of lime peel and to determine its in vitro Sun Protection Factor (SPF) using a UV-Vis spectrophotometer. Three formulations were prepared with different extract concentrations: 5% (F1), 10% (F2), and 15% (F3), along with a control without extract (F0). The formulations were evaluated for organoleptic properties, homogeneity, pH, viscosity, spreadability, and SPF values at wavelengths of 290–320 nm.

The results showed that all formulations were thick, homogeneous, and had a neutral pH of 6, meeting SNI requirements. Viscosity decreased with increasing extract concentration, from 132 ± 8.00 mPa·s (F0) to 72 ± 4.00 mPa·s (F3), but all values remained within the acceptable range for spray gels. All formulations produced a uniform and smooth spray pattern. SPF values increased with extract concentration, with F1 at 10, F2 at 13, and F3 at 15. F1 and F2 were classified as low protection, while F3 showed medium protection. These findings indicate that lime peel ethanol extract has potential as a natural sunscreen active, although further formulation optimization is required to improve its UV protective effectiveness.

Keywords: *Lime, Citrus aurantiifolia, Sunscreen Spray, Natural sunscreen, Sun protection factor (SPF).*