ABSTRACT

Betel leaves (Piper betle L.) are known to have antibacterial and antioxidant properties because they contain alkaloids, tannins, carbohydrates, amino acids, steroids, essential oils and flavonoids. However, the absorption efficiency of active betel leaf compounds by the body is still low, with an average absorption value of 0.307A for phenolic compounds, which is classified as less efficient based on the Lambert-Beer law (ideal range 0.2A–0.8A). To increase this efficiency, this research developed a nanoemulsion formulation based on Polyvinylpyrrolidone (PVP). This research aims to examine the effect of PVP concentration on the stability and characterization of PVP/betel leaf extract nanoemulsion, evaluate its antibacterial activity, and characterize the physicochemical properties of the best formulation. Variations in PVP formulation include N1 (0%), N2 (1%), N3 (2.5%), and N4 (5%). The results showed that formulations with PVP concentrations of 2.5% (N3) and 5% (N4) provided the best stability, with viscosities of 1020 cP and 1960 cP respectively, average particle sizes of 175 nm and 150 nm, distribution values droplets of 0.30 and 0.25, and zeta potential values of -28 mV and -32 mV. Morphological observations showed a uniform droplet size, while antibacterial activity showed an inhibitory zone diameter against Escherichia coli of 0.727 cm (N3) and 0.623 cm (N4), and against Staphylococcus aureus of 1.68 cm (N3) and 2.0667 cm (N4). In conclusion, PVP/betel leaf extract nanoemulsion has the potential to be an effective and stable drug delivery system, supporting its use in natural ingredient-based medical therapy.

Keywords: Betel leaf, nanoemulsion, PVP, drug delivery