

ABSTRACT

Hair functions as both an aesthetic and protective element; however, disorders such as androgenetic alopecia (AGA), which accounts for approximately 95% of hair loss cases, can reduce patients' quality of life. Ginkgo biloba oil (Ginkgo biloba L.), rich in terpenoids (ginkgolides), has the potential to stimulate follicular angiogenesis through increased production of Vascular Endothelial Growth Factor (VEGF), while candlenut oil (Aleurites moluccana L.) contains essential fatty acids capable of tissue repair and stimulating hair growth. Limitations such as susceptibility to oxidation, low water solubility, and limited absorption are addressed through liposome-based delivery systems. Coconut phospholipids were selected as natural liposome-forming agents due to their high glycerophospholipid content. This study aimed to determine the optimal coconut liposome formulation to improve the stability of Ginkgo biloba oil and candlenut oil, as well as to evaluate the effect of coconut liposomes on the physicochemical properties of shampoo formulations. The results showed that Ginkgo biloba oil and candlenut oil were successfully encapsulated in coconut liposomes, as indicated by FTIR spectra that did not reveal new functional groups. The CLGK2:1 formulation (phospholipid-to-oil ratio of 2:1, m/m) was identified as the most optimal based on creaming index (CI), pH, and encapsulation efficiency reaching 85%. PSA and ZPA analyses showed particle sizes of around 200 nm, PDI 0.45–0.48, and zeta potential ranging from –96 to –53 mV over 60 days of storage. TEM analysis confirmed the vesicular spherical morphology of the liposomes, while freeze-drying treatment was found to improve particle homogeneity and distribution, indicating potential as a long-term storage method. Application in shampoo formulations demonstrated that the addition of coconut liposomes did not affect physicochemical properties, while hedonic testing revealed panelist preference levels of 78.12% for shampoo without coconut liposomes (Sho-Control) and 79.58% for shampoo with coconut liposomes (Sho-CLGK).

Keywords: liposome, phospholipid, Ginkgo biloba oil, candlenut oil, shampoo