

## ABSTRACT

The high demand in the cosmetics industry to discover novel active ingredients has been rising recently due to aging, mostly caused by the build-up of free radicals in the skin. Previously, the cosmetics industry promoted the use of ascorbic acid as an anti-aging treatment due to its antioxidant activity and potential in improving collagen production. However, low stability towards exposure to lights made ascorbic acid hard to preserve. As this problem arises, the search for ascorbic acid substitutes from plant extract and plant residue has been the main focus of cosmetic research recently. One of the most well-known plant residues is cocoa pod husk (CPH), which made 67-76 % of the cocoa fruit. Many studies stated an abundant amount of phytochemical content is still left in Cocoa Pod Husk and is known to possess antioxidant potential. Despite that, many extracts showed low penetrations due to their hydrophilicity. Thus, this study aimed to investigate CPH antioxidant potential and also to formulate a way to enhance its penetration with good stability. In this case, encapsulation by niosome was chosen due to its smaller and higher stability for encapsulation compared to the liposome. This objective was achieved through the measurement of total phenolic and flavonoid content, antioxidant Assays (DPPH, ABTS, FRAP), stability tests (pH, Encapsulation Efficiency, Zeta Potential, Particlesize), and penetration study using the Franz-diffusion apparatus. The TPC and TFC assay yielded in  $164.26 \pm 1.06$  ppm GAE/g extract and  $4.23 \pm 0.13$  ppm QE/g extract respectively. CPH extract also yielded  $21.52 \pm 2.2$  ppm,  $17.37 \pm 0.75$ , and  $81.78 \pm 5.47$  ppm AAE/g extract for DPPH, ABTS, and FRAP respectively. In the Niosomal formulation, F1 (soya lecithin:span 80 4:1) has the highest penetration enhancing capability and stability compared to other formulations. The cumulative drug release % of this formula at the highest was  $83.75 \pm 1.37$  % at 24 hours with a peak rate of penetration value of  $653.27 \pm 21.42$  ug/h at 4 hours timepoint. In conclusion, CPH ethanolic extract has the potential as an anti-aging ingredient and can be formulated into niosomes. The superior formulation was proven to be Formulation F1 due to its ability to encapsulate, stabilize and enhance penetration of CPH extract towards the skin.