UNIVERSITI TEKNOLOGI MARA

SKIN BARRIER MODULATION BY HIBISCUS ROSA-SINENSIS MUCILAGE FOR TRANSDERMAL DRUG DELIVERY

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MSc

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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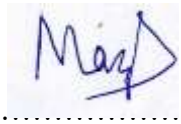
Signature of Student	:	 ……..
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ABSTRACT

Transdermal drug delivery system provides continuous controlled delivery of active ingredients through the human skin and into the bloodstream. Poor penetration of most drugs into the skin has led to numerous studies being conducted to increase their permeability. The present study investigated the ability of *Hibiscus rosa-sinensis* (HRS) leaves mucilage in modifying skin barrier for transdermal drug delivery. The mucilage obtained from HRS leaves is a novel source of polysaccharides, and its skin permeation modulating effect has yet to be explored. Dried-powdered mucilage was extracted from the leaves of HRS, and its physicochemical properties were analysed. The HRS gels were formulated with three concentrations of HRS mucilage, namely 1 (CL1), 1.5 (CL1.5), and 2 (CL2) %(w/w) using caffeine as a model drug. The *in vitro* drug release and permeation profiles of caffeine were examined using vertical diffusion cells. Physicochemical properties of HRS mucilage and HRS gels were characterised by molecular weight analysis, differential scanning calorimetry (DSC), particle size, viscosity, pH, attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopy, and X-ray diffractometry (XRD), while the mechanisms of drug permeation were evaluated by subjecting the rat skin to scanning electron microscopy (SEM), ATR-FTIR, and DSC. The results indicated that the releases of caffeine from HRS gels in 24 hours were 47.17 ± 5.72, 46.90 ± 2.25 and 48.63 ± 2.33 % of CL1, CL1.5 and CL2, respectively (ANOVA: $p > 0.05$). Nevertheless, the CL2 gel demonstrated a significantly highest drug permeation (2029.44 ± 313.39 μg cm^{-2}) when compared to caffeine solution (1400.48 ± 167.15 μg cm^{-2}), CL1 (1129.53 ± 425.64 μg cm^{-2}), and CL1.5 (1007.27 ± 588.73 μg cm^{-2}) (ANOVA: $p < 0.05$). The CL2 possessed a combination of higher viscosity, higher amorphous property and smaller particle size than CL1 and CL1.5. High viscosity resulted in prolonged contact with the skin. High amorphous denotes that the particles exist as high energy compound with enhanced drug solubility and thermodynamic activity, thus facilitated the drug permeation. In addition, small particle size enabled greater contact and interaction with the stratum corneum. HRS gels generally altered the barrier and permeability of the skin by perturbing the lipid and protein structures, acting on the helical keratin filaments as well as through the O–H and/or N–H interactions. These were then reduced the diffusional resistance for drug transport and increased the drug permeation. The optimal concentration of HRS mucilage at 2 %(w/w) (CL2) was deemed useful in facilitating the transdermal delivery of caffeine.

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