

UNIVERSITI TEKNOLOGI MARA

**FORMULATION,
CHARACTERIZATION AND IN-
VITRO
PERMEATION/PENETRATION OF
 α -ARBUTIN CREAMS AND
HYDROGEL**

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of the requirements for the degree of
**Master of Science
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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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ABSTRACT

α -Arbutin is a skin whitening active which is highly hydrophilic and difficult to permeate into hydrophobic skin barrier. Nowadays, cosmetic consumers are mainly focused on the multi-sensory experience of a cosmetic product. However, a cosmetic product with good sensory feeling upon application is not sufficient without ensuring the effectiveness of α -arbutin to be permeated well into the epidermis. In this study, α -arbutin creams and hydrogel were prepared to determine the influence of emulsifying thickener, polymer and natural oils on texture and permeation of α -arbutin. Prior to creams and hydrogel formulation, different types of polymer solution such as Carbopol[®] Ultrez-30, Aquagel 35C, Aquagel 45, Sepigel 305[™] and SepiMax Zen[™] were screened by evaluating the texture of formulations and diffusion profile of α -arbutin. Aquagel 35C was selected to be used in the optimized formulation because it offered good emulsification and aesthetically appealing in spite of moderate diffusion of α -arbutin. Then, α -arbutin creams and hydrogel were formulated and optimized by using thickeners (Cetareth-20/cetearyl alcohol or Olivem[®] 1000 or Olivem[®] 2020) and natural oils (olive oil or palm kernel oil). Subsequently, the physicochemical properties of formulations were characterized. The result showed that all of the formulations exhibited good texture and stability within shelf-life of 6 months as well as possessed shear-thinning properties which is an ideal characteristic in cosmetic application. Then, each creams and hydrogel were subjected to Franz Diffusion Cell by using a cellulose acetate membrane and rat skin at 37°C for 6 hours. Then, the sample was analyzed by using High-Performance Liquid Chromatography (HPLC) to determine the amount, flux and diffusion coefficient of α -arbutin. In-vitro transmembrane diffusion study by using cellulose acetate membrane showed that hydrogel has the highest cumulative amount of $1490.7 \pm 1.06 \mu\text{g}$ of α -arbutin. Then, a cream containing palm kernel oil and Olivem[®] 2020 offered higher diffusion of α -arbutin ($1263.7 \pm 23.4 \mu\text{g}$) than other creams. In contrast, the in-vitro rat skin permeation and penetration study revealed that formulation containing palm kernel oil and Cetearyl alcohol/Cetareth-20 has better permeation than Olivem[®] 1000 and Olivem[®] 2020. In conclusion, the study suggested that hydrogel and creams containing palm kernel oil can enhance the permeation of α -arbutin than creams with olive oil, meanwhile, Olivem[®] 2020 offered better physical appearance and sensory feeling hence they are recommended to be used in cosmetic preparation.

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