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Formulation, development and assessment of skin whitening efficacy of whitening cream of *Glycyrrhiza glabra* (LICORICE)

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Skin whitening cosmetics attract an important place in the global cosmetic market. Among them natural skin whitening agents are beneficial due to less toxicity and side effects. Most of the whitening cosmetics are competitive inhibitors of tyrosinase, the key enzyme in melanogenesis. The present study describes the development of effective skin whitening cream using readily available natural ingredients such as virgin coconut oil and distilled water as the base. Tween 80® was used as a surfactant which lowers interfacial tension and prevents the separation of phases. In this study, licorice extracted using methanol was incorporated into stable cream bases. The stability studies of the formulations and skin whitening effect of the extract in terms of tyrosinase inhibitory activity was investigated.

Two stable bases (formulation 1[F1] and formulation 2[F2]) with different ratios of virgin coconut oil (F1-41.2% and F2- 48.6%), Tween 80® (F1-22.3% and F2-24.3%), and distilled water (F1-36.5% and F2-27.1%) were identified and studied based on previous research done at the Department of Pharmacy. Methanolic licorice extract in five different concentrations (1-5% w/w) were incorporated into the selected cream bases. Characterizations such as microscopic analysis, pH and viscosity were measured and stability studies such as visual observations in accelerated temperatures, freeze thaw and centrifugation tests were also conducted.

According to the microscopic analysis, formulated creams were oil in water emulsions. The pH of the formulations varied with the temperature and creams showed higher stability at lower temperature (at 8°C). Viscosities of the creams of F2 containing high virgin coconut oil ratio were greater than the creams of F1 having lower virgin coconut oil content. According to accelerated stability studies at 8°C, all the cream bases of F1 and F2 were stable up to 40 days. Anti-tyrosinase assay for crude extract of licorice showed 81.5% inhibition. This indicated the (*in vitro*) whitening effect of licorice as an effective tyrosinase inhibitor.

Present study has shown that creams kept at 8°C were more stable than the creams kept at the room temperature and 40°C. According to optimization studies of the anti-tyrosinase assay, licorice had higher tyrosinase inhibitory activity and is suitable to be used in skin whitening creams. Further studies are in progress to evaluate the whitening effect of the formulated creams.