Arbutin Extraction from Herbal Plants for Application in Cosmeceuticals

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Abstract

Arbutin is a naturally occurring compound with the ability to inhibit tyrosinase which is an enzyme involved in the melanin synthesis and is therefore widely used as an active ingredient in skin-brightening cosmeceutical products. This study aimed to detect and compare arbutin contents among six types of herbs, namely bamboo grass, roselle, pandan, Cuban oregano, Chinese celery, and sawtooth coriander, to evaluate their potential as natural sources of arbutin. Each plant sample was extracted using 70% ethanol and re-dissolved using 4 different types of organic solvents including hexane, dichloromethane, ethyl acetate and methanol. The presence of arbutin was initially screened by Thin Layer Chromatography (TLC), and the arbutin content was determined using High Performance Liquid Chromatography (HPLC). Results revealed that the arbutin content varied among the herbal species. With arbutin being clearly detected in certain plants such as roselle and pandan. The findings supported that these hersb can be used as natural sources of arbutin and provided fundamental data for the selection of plant materials leading to the development of cosmeceuticals products derived from natural compounds in the future.

Introduction

- Arbutin is a natural compound with tyrosinase inhibitory activity.
- Tyrosinase is an enzyme involved in melanin biosynthesis.Therefore, arbutin is commonly used as an active ingredient in cosmeceutical products.
- The products developed from this knowledge can help promote skin brightening.

Objectives

- To detect the presence of arbutin in six selected herbal plants
- To compare the arbutin content among different plant species
- To evaluate the potential of herbal plants as natural sources of arbutin

Methodology

Pretreatment



Cleaning of Leaves → Drying in Hot Air Oven → Blending to Fine Powder → Storing at Room Temperature until Use

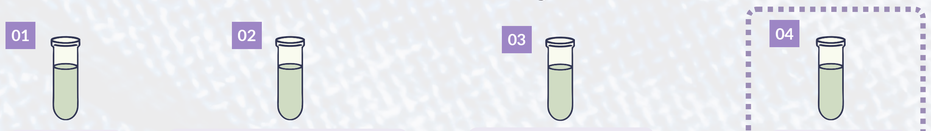
Extraction



Soaking in the 70% Ethanol for 1 day → Filtration → Evaporation → Freeze Drying

Different Solvents

The crude extracts were re-dissolved in solvents with different polarity levels to evaluate solvent effects on arbutin solubility



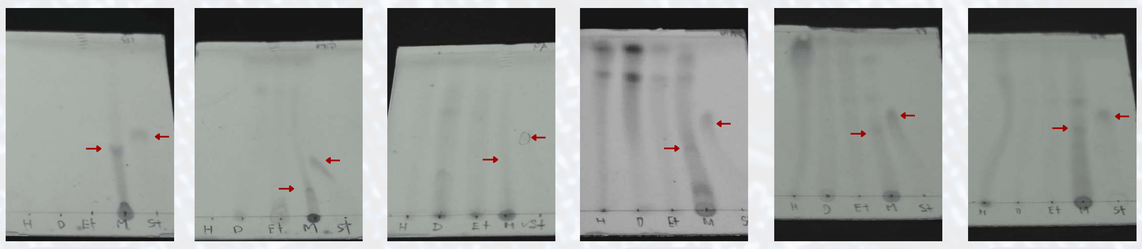
01 Hexane · 02 Dichloromethane · 03 Ethyl acetate · 04 Methanol

Analysis

- Preliminary detection of arbutin was performed using Thin Layer Chromatography (TLC).
- Quantitative analysis of arbutin was conducted using High Performance Liquid Chromatography (HPLC)

Results & Discussion

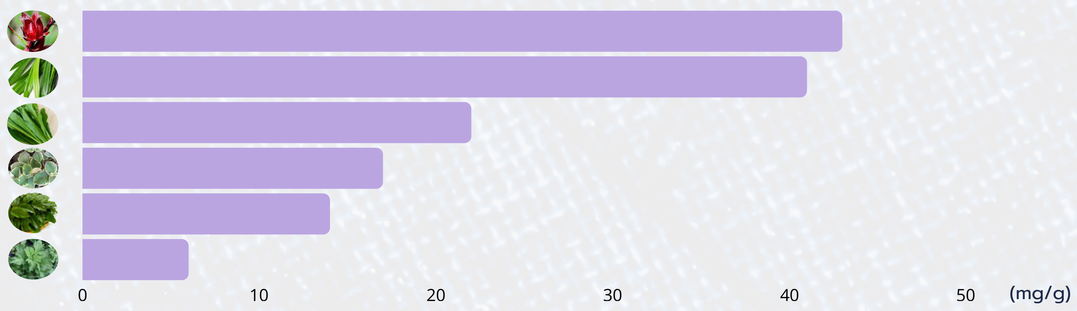
TLC



Bamboo grass · Roselle · Pandan · Cuban oregano · Chinese celery · Sawtooth coriander

Thin layer chromatography (TLC) was used as a preliminary screening method for arbutin in plant extracts. Bamboo grass and Chinese celery showed R_f values and similar appearance under the UV light to that of the arbutin standard, suggesting possible presence. However, since TLC is qualitative and co-migration may occur, confirmation by HPLC was required.

HPLC



- Arbutin was quantified by HPLC, showing a retention time of 1.7–1.8 minutes that corresponded to the standard reference compound. The concentration of arbutin was determined using a calibration curve and expressed as mg per gram of extract (mg/g)
- The highest arbutin content was found in roselle, followed by that of pandan, sawtooth coriander, Cuban oregano, bamboo grass, and Chinese celery.
- Although the retention time matched the standard, retention time alone cannot fully confirm the presence of the compound. Other techniques such as LC–MS or NMR would provide stronger confirmation. However, the agreement between TLC and HPLC results supported the conclusion.

Conclusion

- The selected herbal plants contain arbutin in detectable amounts.
- Roselle showed the highest arbutin content, followed by pandan, sawtooth coriander, Cuban oregano, bamboo grass, and Chinese celery.
- This study provides fundamental data for selecting natural natural sources of arbutin.
- The findings support future development of plant-based cosmeceutical products.

References

[1.] Parejo, I., Viladomat, F., Bastida, J., & Codina, C. (2001). A single extraction step in the quantitative analysis of arbutin in bearberry (Arctostaphylos uva-ursi) leaves by high-performance liquid chromatography. Phytochemical Analysis, 12(5), 336–339. doi:10.1002/pca.602.

[2.] Thongchai, W., Liawruangrath, B., & Liawruangrath, S. (2007). High-performance liquid chromatographic determination of arbutin in skin-whitening creams and medicinal plant extracts. Journal of Cosmetic Science, 58(1), 35–44.

Acknowledgements

Advisors : Assoc.Prof. Dr. Lalida Shank
Assoc.Prof. Dr. Thunwadee Limtharaku
Laboratory Members : Ms. Jidapa Tamaongmoon
Ms. Maythawinee Jaidee