

Specification : Kaffir Lime Peel Extract (Manose RM-0079)

Application : An active ingredient for hair darkening products

1. Name of the raw material : Kaffir Lime Peel Extract
2. Active components : Essential oils and phenolic compounds⁽¹⁾
3. Common and scientific name/ Family of the plant : Kaffir Lime (*Citrus hystrix* DC.)/Rutaceae
4. Physical appearance : Dark brownish semi-solid⁽²⁾
5. pH : 3.33⁽²⁾
6. Standardization : HPLC fingerprint using limonene as a marker⁽³⁾
7. Solubility : Soluble in alcohol⁽²⁾
8. Microbial contamination : No pathogenic microorganism with less than 1,000 cfu/g of the total plate count of bacteria, yeast and fungi which is conformed to the Thai FDA regulation⁽²⁾
9. Biological activities :
 - Antioxidative activity by DPPH radical scavenging with the SC₅₀ value of 0.19±0.03 mg/ml (ascorbic acid = 0.10±0.01 mg/ml)⁽²⁾
 - Melanin stimulation activity in melanoma (B16F10) with melanin content relative ration of 117.48±20.54% at 1 mg/ml 55.32±0.86% (theophylline at 0.1 mg/ml = 131.52±32.30%)⁽²⁾
 - Tyrosinase stimulation activity in melanoma (B16F10) with tyrosinase content relative ration of 129.68±12.11% at 1 mg/ml (theophylline at 0.1 mg/ml = 116.58±41.25%)⁽²⁾

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| 10. Animal / human performance test | : | - |
| 11. Safety | : | No cytotoxicity on human skin fibroblasts with cell viability of $87.90 \pm 4.62\%$ at 1 mg/ml ⁽²⁾ |
| 12. Pharmaceutical, food supplement or cosmetic applications | : | Products for hair darkening ⁽²⁾ |
| 13. Recommended concentrations in the product | : | 0.1 – 2 %w/w ⁽²⁾ |
| 14. Storage | : | Keep in tight and light protection container at room temperature |
| 15. Precautions | : | None |
| 16. Cost per kg | : | Please request |

References

1. Agouillal F., Taher Z. M, Moghrani H., Nasrallah N. and El-Enshasy H. (2017). A Review of Genetic Taxonomy, Biomolecules Chemistry and Bioactivities of *Citrus Hystrix* DC. Biosci Biotech Res Asia, 14(1).
2. Manose In-house Project “Development of serum containing extracts from Thai medicinal plants for hair darkening stimulation” Manose Health and Beauty Research Center (www.manose.co), unpublished, 2022.
3. Borusiewicz M., Trojanowska D., Paluchowska P., Janeczko Z., Petitjean MW. and Budak A. (2017). Cytostatic, cytotoxic, and antibacterial activities of essential oil isolated from *Citrus hystrix*. ScienceAsia, 43. 96-106.



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