Research Article

Citrus Bliss Bomb: Kaffir Lime Leaf Antioxidant Bath Bomb

Nur Maisarah Sarizan[1,*], Muhammad Izzat Amir Rozali[2], Nuraisyah Mohd Khusairy Faisal[3], and Eida Adliena Qamarul Azman[4]

[1] Faculty of Applied Sciences, Universiti Teknologi MARA, Perlis Branch, Arau Campus, Perlis, Malaysia; maisarahsarizan@uitm.edu.my; ORCID ID : 0000-0002-0129-5571

[2] Faculty of Applied Sciences, Universiti Teknologi MARA, Perlis Branch, Arau Campus, Perlis, Malaysia; 2021868974@student@uitm.edu.my

[3] Faculty of Applied Sciences, Universiti Teknologi MARA, Perlis Branch, Arau Campus, Perlis, Malaysia; 2021843138@student@uitm.edu.my

[4] Faculty of Applied Sciences, Universiti Teknologi MARA, Perlis Branch, Arau Campus, Perlis, Malaysia; 2021476542@student@uitm.edu.my

[*] Correspondence: maisarahsarizan@uitm.edu.my; +6049882359.

Abstract: *Bath bombs have gained immense popularity for their ability to elevate ordinary baths into luxurious spa-like experiences, offering effervescence, captivating fragrance, and skin-nourishing benefits. 'Citrus Bliss Bomb' is an innovative bath bomb that incorporates Kaffir lime (Citrus hystrix) leaf extract. Conventional bath bombs frequently overlook targeted skincare benefits, prompting exploration into botanical alternatives. Consumer skincare needs to extend beyond the sensory allure of bath bombs, often lacking solutions for issues such as oxidative stress and inflammation. Recognizing this gap, the study aims to bridge it by leveraging the potential of Kaffir lime leaf extract in bath bomb formulations. The primary objective is to formulate antioxidant-rich bath bomb, harnessing the skincare properties inherent in Kaffir lime leaf extract. The study began with ethanol extraction of Kaffir lime leaf, followed by 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay for antioxidant testing, and finally the formulation and production of the bath bomb. Having meticulously evaluated its antioxidant potential, this study successfully formulated an antioxidant-rich bath bomb, harnessing the skincare properties inherent in Kaffir lime leaf extract. With antioxidants effectively neutralizing free radicals, this inventive bath bomb could promote healthier skin and creates a revitalizing ambiance with the refreshing aroma of Kaffir lime leaves.*

Keywords: antioxidant; bath bomb; DPPH assay; Citrus hystrix; Kaffir lime leaf



Copyright: © 2024 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. INTRODUCTION

A bath bomb is a solid mixture of various ingredients, typically a mixture of a weak acid and a strong base as well as other components like fragrances, oils, and coloring agents. The bath bomb will dissolve when placed in water, releasing bubbles, scents, and sometimes colors into the bath. During the dissolving process, a chemical reaction occurs between the acids and bases in the mixture, resulting in the release of carbon dioxide gas (Darne et al., 2023). This reaction is what creates the fizzing effect often associated with bath bombs. Bath bombs have emerged as a popular indulgence in modern self-care routines, offering a luxurious spa-like experience in the comfort of one's home. Beyond their aesthetic appeal and captivating fragrances, there is growing demand for bath bombs that provide

tangible skincare benefits. This shift in consumer preferences towards natural and holistic skincare solutions has propelled the exploration of botanical ingredients with potent antioxidant properties.

One such botanical of interest is the Kaffir lime (*Citrus hystrix*) leaf, renowned for its aromatic fragrance and rich antioxidant content (Zhaou et al., 2023). The leaves emit a potent and recognizable scent attributed to their rich content of volatile compounds such as citronellal, β-pinene, limonene, and sabinene found in the essential oil (Ratanachamnong et al., 2023). In traditional medicine, these leaves have been employed to alleviate various ailments including headaches, inflammation, flu, fever, sore throat, digestive issues, hypertension, and skin conditions, possibly owing to their antioxidant and antimicrobial characteristics (Siti et al., 2023). This study aims to determine the antioxidant properties of Kaffir lime leaf extract in the formulation of a bath bomb, with a product name 'Citrus Bliss Bomb.'

In this study, we present a systematic approach to the development of the 'Citrus Bliss Bomb,' encompassing sample preparation, extraction, antioxidant testing, formulation, and production phases. Through rigorous experimentation and meticulous formulation, we aim to showcase the potential of Kaffir lime leaf extract as a valuable ingredient in skincare products, specifically in bath bomb formulation, we seek to offer consumers a holistic self-care experience that not only indulges the senses but also nurtures and protects the skin.

2. METHOD & MATERIAL

The development of 'Citrus Bliss Bomb' consisted of five important phases which are sample preparation, sample extraction, antioxidant test (DPPH Assay), sample formulation, and sample production (Figure 1).

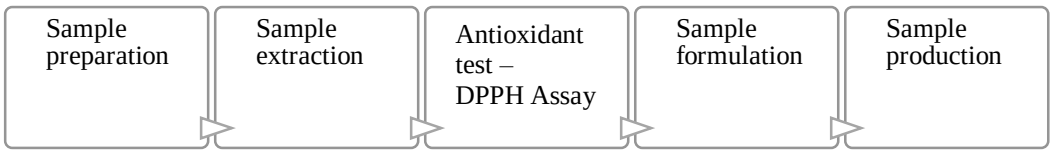

Figure 1. Development of 'Citrus Bliss Bomb'

2.1 Sample preparation

Fresh Kaffir lime leaves were collected and cleaned to remove any impurities. They were then dried at 50°C oven until all moisture was removed. After the leaves are completely dry, they are ground into a fine powder using a dry food blender. The powder is then stored in a dry, airtight container until it is needed for the next phase of the process.

2.2 Sample extraction

The dried Kaffir lime leaves were finely ground into a powder and subjected to ethanol extraction to isolate the bioactive compounds. The extraction process was conducted under controlled conditions to maximize yield and preserve the integrity of the extracted compounds.

2.3 Antioxidant test - DPPH assay

The antioxidant activity of the extracted compound was evaluated using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay. A solution of DPPH was prepared, and varying concentrations of the extracted compound were added. The reduction in DPPH absorbance was measured spectrophotometrically to determine the antioxidant capacity of the extract.

2.4 Sample formulation

Based on the results of the antioxidant test and desired product characteristics, the formulation of the bath bomb was developed. The extracted compound was incorporated into a base formulation consisting of ingredients such as baking soda, citric acid, essential oils, and moisturizing agents to create the 'Citrus Bliss Bomb'.

2.5 Sample production

The finalized formulation was scaled up for production. The ingredients were carefully weighed and mixed according to the predetermined recipe. The mixture was then molded into the desired bath bomb shape and allowed to dry and harden before packaging in plastic wrap.

3. FINDINGS

The Kaffir lime leaves were successfully prepared and extracted using ethanol, resulting in a concentrated extract rich in bioactive skincare compounds. The DPPH assay revealed significant antioxidant activity of the extracted compound. A dose-dependent reduction in DPPH absorbance was observed, indicating potent free radical scavenging ability.

The formulated bath bomb, 'Citrus Bliss Bomb,' exhibited desirable physical characteristics, including effervescence, fragrance, and skin-nourishing properties attributed to the incorporation of the Kaffir lime leaf extract. The production process yielded bath bombs of consistent quality, meeting predetermined specifications for appearance, texture, and aroma

4. DISCUSSION

The substantial antioxidant activity demonstrated by the Kaffir lime leaf extract highlights its potential as a natural skincare ingredient. The presence of bioactive compounds, such as flavonoids and phenolics, likely contributed to its free radical scavenging properties (Hien et al., 2020). The antioxidant-rich nature of the 'Citrus Bliss Bomb' suggests potential benefits for skin care, including protection against oxidative stress-induced premature aging and promotion of overall skin health. Incorporating Kaffir lime leaf extract into bath bomb formulations offers a natural alternative to synthetic additives, catering to consumer preferences for clean and green skincare products.

Further research is warranted to explore the synergistic effects of Kaffir lime leaf extract with other botanicals and active ingredients in skincare formulations. Additionally, clinical studies are needed to validate the observed skincare benefits and assess the efficacy of the 'Citrus Bliss Bomb' in improving skin condition over time. Overall, the results underscore the potential of Kaffir lime leaf extract as a valuable ingredient in skincare formulations, exemplified by the development of the antioxidant-rich 'Citrus Bliss Bomb' bath bomb.

5. CONCLUSION

The development of the 'Citrus Bliss Bomb' bath bomb, enriched with Kaffir lime leaf extract, represents a significant advancement in the integration of natural skincare ingredients into personal care products. Through systematic sample preparation, extraction, and formulation, we successfully harnessed the antioxidant potential of Kaffir lime leaves to create a product that offers both indulgent sensory experiences and tangible skincare benefits. Moving forward, further exploration of the synergistic effects of Kaffir lime leaf extract with other botanicals and active ingredients in skincare

formulations is warranted. Clinical studies to validate the observed skincare benefits and assess long-term efficacy are also essential to solidify the product's position in the competitive skincare market.

Acknowledgments: We would like to express our heartfelt gratitude to the following students for their invaluable assistance and contributions to this project: Alysha Amirah Zainullah, Ahla Amani Ahmad Syayuthi, Ayra Humayrah Mohammad Shahrazel, and Irdiena Yasmeen Mohd Yusree. Their efforts in data collection and active involvement were instrumental in the successful completion of this research. We deeply appreciate their dedication, time, and hard work. We also extend our sincere thanks to the Faculty of Applied Sciences, Universiti Teknologi MARA (UiTM) Perlis, for the support given throughout this project.

References

Darne, C. S., Maske, M. P., Gore, P. A., & Baheti, J. R. (2023). Formulation and evaluation of antifungal and muscle relaxant herbal bath bomb containing cinnamon oil. *International Journal of Pharmaceutical Sciences*, 1(08), 1-1.

Hien, T. T., Quyen, N. T. C., Truc, T. T., & Quan, P. M. (2020, December). Evaluate the chemical composition of Kaffir lime (*Citrus hystrix*) essential oil using the classical method. *IOP Conference Series: Materials Science and Engineering*, 991(1): 12014.

Ratanachamnong, P., Chunchaowarit, Y., Namchaiw, P., Niwaspragrit, C., Rattanacheeworn, P., & Jaisin, Y. (2023). HPLC analysis and in vitro antioxidant mediated through cell migration effect of *C. hystrix* water extract on human keratinocytes and fibroblasts. *Heliyon*, 9(2), e13068.

Siti, H. N., Mohamed, S., & Kamisah, Y. (2022). Potential therapeutic effects of *Citrus hystrix* DC and its bioactive compounds on metabolic disorders. *Pharmaceuticals*, 15(2), 167.

Zhao, Z., Wang, Y., Nian, M., Lv, H., Chen, J., Qiao, H., Yang, X., Li, X., Chen, X., Zheng, X., & Wu, S. (2023). *Citrus hystrix*: A review of phytochemistry, pharmacology and industrial applications research progress. *Arabian Journal of Chemistry*, 105236.