

E-BOOK OF EXTENDED ABSTRACT

THE 14TH INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025



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TURNING WASTE INTO WELLNESS: SUSTAINABLE SOAP FROM BEEF (*BOS TAURUS*) TALLOW AND BUTTERFLY PEA FLOWER (*CLITORIA TERNATEA*)

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ABSTRACT

This study investigates the formulation of sustainable soap using *Bos taurus* tallow (beef tallow), *Olea europaea* (olive oil), and *Clitoria ternatea* (butterfly pea flower) extract, with the goal of reusing waste materials while improving soap quality. The objectives were to explore the potential benefits of using animal fat waste in soap production and to enhance product usability by incorporating natural ingredients suitable for sensitive skin. The chemical properties of the soaps were analysed, and their foaming performance, solubility, pH, moisture retention, and skin compatibility were evaluated.

Keywords: soap, beef tallow, butterfly pea flower, olive oil, environmental-friendly

1. INTRODUCTION

In recent years, there has been a growing interest in developing sustainable and cost-effective personal care products that minimise environmental impact. Conventional soap production relies heavily on plant-based oils such as olive and coconut oil, which, although effective, are relatively expensive and place pressure on agricultural resources (Daud et al., 2015). This has led to a search for alternative raw materials that are both economically and environmentally viable. Beef tallow, a by-product of the meat industry, is often disregarded and considered waste, hence presenting further challenges to solid waste management. It contains triglycerides and has proper saponifiable properties which make it a good substitute for oil in soap making (Osei-Tutu et al., 2019). Its use in soap production would reduce organic waste and promote sustainability. Olive oil is, in fact, very famous for its moisturising and skin-conditioning benefits, as it has high levels of oleic acid and polyphenols (Aburjai & Natsheh, 2003). This research focuses on formulating sustainable soap from beef tallow and olive oil. Therefore, the objectives of this study are to determine the physical, chemical, and dermatological characteristics of the formulated soap, which reducing the impact on cost and environmental sustainability.

2. METHODOLOGY

2.1. Saponification of Soap

Beef tallow was melted, filtered, cooled, and then cooled to a temperature of 40–50°C. A lye solution was prepared by weighing (14.4 g NaOH in 50 mL distilled water), cooled to 30–35°C. Beef tallow was weighed to 40 g, while 10 g of dried butterfly pea flower extract was dissolved in 20ml of warm distilled water. The two solutions were blended at this temperature using a stick blender to trace. The soap was poured into molds and allowed to be cured. The same was done with two formulations: BT (1) Beef tallow & BT (2) Beef tallow and olive oil.

2.2 Physical Properties Testing

- i. FTIR was used to investigate the chemical structures, and functional groups present in the two soap formulations: BT (1) and BT (2).
- ii. pH: The soap was cut into 1 x 1 cm and put into a beaker. Next, it is diluted with 50 ml of distilled water. Then to measure the solution, a pH meter is used.
- iii. Foaming: Soap 1g was shaken with water in a test tube to observe the height of the foam formed.

- iv. Moisture Content: The oven drying method was used, 2 periods of 60 minutes.
- v. Solubility: The soap cubes were immersed in water for time intervals of twenty-four, forty-eight, and seventy-two hours respectively.
- vi. Sensitivity: Patch tests were conducted behind the ear for 24 hours.

3. FINDINGS

The wavenumber spectra of beef tallow and its mixture with olive oil show several important differences. A slight shift in the peak around 2850 cm^{-1} suggests the presence of hydroxyl groups, likely due to olive oil's polar compounds. Both samples display similar peaks at around 2918 cm^{-1} and 3372–3381 cm^{-1} , indicating shared hydrocarbon structures and saturated fatty acids. A peak at 1738 cm^{-1} in beef tallow, linked to carbonyl groups, is reduced in the mixture, possibly due to olive oil's influence. The consistent peak near 1556 cm^{-1} shows unsaturated fatty acids, with olive oil increasing the unsaturation in the blend.

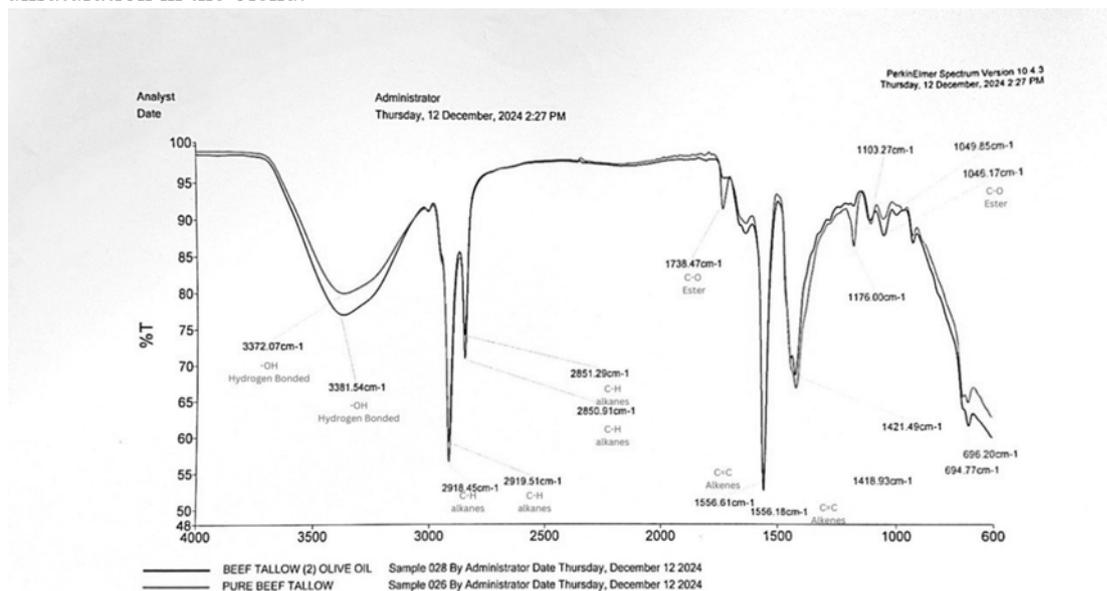


Figure 1: FTIR Spectra Comparison Between BT (1) and BT (2).

Table 1 shows the evaluation of the two soap formulations BT (1) and BT (2) which demonstrates the distinct advantages of incorporating olive oil and butterfly pea flower extract into beef tallow-based soap. BT (1), composed solely of beef tallow, exhibited excellent moisture retention but limited foaming and solubility. However, BT (2), with added olive oil, showed superior foaming performance and reduced moisture absorption, indicating better usability and shelf life. All formulations were confirmed to be non-irritating and safe for skin contact. The addition of olive oil not only improves functional performance but also aligns with sustainable, eco-conscious product development. Therefore, BT (2) is promising formulations for further development.

Table 1 The Comparative Physical Properties of Soap Formulation

Parameter	BT (1)	BT (2)
pH	10.10	9.79
Foam Height (cm)	4.7	5.5
Moisture Content (%)	13.89 → 20.83	10.78 → 14.77
Initial → After 120 mins		
Solubility	Low	Moderate
Skin Sensitivity Score	0	0

4. CONCLUSION

This study demonstrates the viability of producing sustainable and skin-friendly soap using beef tallow, olive oil, and butterfly pea flower extract. The use of beef tallow, a by-product of the meat industry, provides an effective solution for reducing organic waste while offering a cost-effective alternative to traditional plant-based oils. The incorporation of olive oil significantly enhanced the soap's foaming

ability and reduced moisture absorption, contributing to a longer shelf life and improved user experience. All two formulations were found to be non-irritating and safe for topical use. Among them, the formulation combining beef tallow and olive oil (BT 2) showed the most balanced performance in terms of solubility, foam production, and skin benefits. This research supports the development of eco-conscious, biodegradable personal care products and encourages the upcycling of agro-industrial waste into value-added consumer goods. Future work should focus on scaling production, optimising ingredient ratios, and exploring the antimicrobial properties of natural additives to further enhance product functionality and market potential.

REFERENCES

- Aburjai, T., & Natsheh, F. M. (2003). Plants used in cosmetics. *Phytotherapy Research*, *17*(9), 987–1000. <https://doi.org/10.1002/ptr.1363>
- Daud, W. R. W., Mohd Nawi, N. I., & Mohamad, A. B. (2015). Soap production: A green chemistry approach using biomass wastes. *Journal of Cleaner Production*, *108*, 1502–1510.
- Jeyaraj, E. J., Subramanian, M., & Umamaheswari, A. (2020). Butterfly pea (*Clitoria ternatea*): A potential herbal blue dye source with antioxidant properties. *Asian Journal of Pharmaceutical and Clinical Research*, *13*(5), 109–113.
- Osei-Tutu, C., Asiamah, D. C., & Yeboah, I. A. (2019). Utilization of animal fat waste in the production of quality soap. *International Journal of Sustainable Chemistry*, *11*(2), 56–64.

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