Research Article

Revolutionizing Handmade Soap: Innovating Emollient Formulations for Enhanced Quality

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Abstract: *The widespread use of commercial soaps containing potentially harmful chemicals like parabens, sulphates, and triclosan has prompted concerns about skin health and overall well-being. This research addresses this issue by proposing a revolutionary approach to handmade soap formulations, focusing on enhancing quality through the incorporation of emollients. Handmade soaps, crafted from natural ingredients, offer a safer alternative to mass-produced varieties, potentially reducing skin irritation and allergic reactions. By utilizing emollients such as cocoa butter, shea butter, and mango butter, this project aims to develop natural soaps tailored to individual skin needs. Emollients play a crucial role in improving skin texture and moisture retention. The methodology involves meticulous formulation and testing to ensure product efficacy and safety. Results indicate that cocoa butter emerges as the optimal base for handmade soap, offering superior stability and suitability. Furthermore, comprehensive analyses of physical appearance, pH levels, viscosity, foam production and retention, total fatty matter, and moisture content provide valuable insights into the quality and performance of the formulated soaps. This research highlights the potential of handmade soaps as a holistic skincare solution, emphasizing the importance of natural ingredients in promoting skin health and well-being. The findings suggest commercialization potential for these innovative emollient-based soap formulations, offering consumers a safer and more customizable skincare option.*

Keywords: handmade soap, emollients, natural ingredients, skincare, quality, formulation, efficacy, safety, holistic, skin health.

DOI: 10.5281/zenodo.11044493

1. INTRODUCTION

The presence of parabens, sulphates, and triclosan in commercial soaps is widely recognized as potentially harmful, linked to allergies, hormonal disturbances, and even certain cancers (Shaikh et al., 2023). Choosing soap isn't just about immediate satisfaction but making a decision that promotes healthier skin in the long run. Utilizing self-produced natural products allows for ingredient adjustments based on individual needs, offering a safer alternative (Mutoharoh et al., 2023). Handmade soaps, typically crafted from high-quality, natural ingredients, steer clear of harsh chemicals found in mass-produced varieties, potentially reducing skin irritation and allergic reactions. These soaps often combine oils and butter from various plants, rich in vitamins, nutrients, and antioxidants essential for skin health and maintenance (Chen, 2019). This project uses a variety of emollients (cocoa butter, shea butter, and mango butter) to create innovative natural handmade soaps up until thorough evaluation testing. Emollients play a crucial role in making skin smoother by filling gaps between skin cells (Gyedu-Akoto et al., 2015). While soaps are indispensable for hygiene, conventional options may lead to skin problems like dryness and allergies (Jacob & Ciyamol, 2019).

Commercial soaps, laden with synthetic ingredients, pose risks to various bodily systems (Shaikh et al., 2023). Handmade soaps, formulated with natural ingredients, provide a safer choice, allowing customization to address specific skin concerns and minimizing exposure to harmful chemicals. Emollients incorporated in handmade soaps deliver moisturizing and skin-nourishing benefits tailored to individual preferences, ensuring a fulfilling sensory experience and holistic skincare (Santer et al., 2018).

2. METHOD & MATERIAL

The ingredients were purchased from various online stores. The formulation for this project was referenced from a PowerPoint slide presented by Baharudin and Suhaili (2022). To create handmade soap, 6g of NaOH was dissolved in 10 ml of distilled water, with caution due to the strong odor emitted. After this, the lye solution was gently mixed and allowed to cool. Meanwhile, the desired amounts of olive oil, palm oil, and different natural butters (shea, cocoa, mango) were melted and combined. Natural clays such as bentonite or himalayan salt were added for their detoxifying and exfoliating properties. The mixture of oils, melted butter, and clays was blended thoroughly. Once blended, the solution underwent saponification upon combining with the lye solution, resulting in the formation of soap molecules and glycerin. After blending, essential oils were added for fragrance, and the mixture was poured into molds and left to solidify for 24 hours. The soap bars were then cured for 4 to 6 weeks in a cool, dry place to allow saponification to complete and for water to evaporate, resulting in harder, gentler, and more stable soap. The soap's effectiveness was evaluated through various tests. These included observing foam production and retention, assessing color and clarity, and determining pH levels. Additionally, the total fatty matter and moisture content of the soap were analyzed to ensure quality and purity.

Table 2.1: Composition of Soap Formulation

NUM	INGREDIENT	FORMULA 1	FORMULA 2	FORMULA 3
1	Olive Oil	98g	98g	98g
2	Palm Oil	28g	28g	28g
3	Distilled Water	34g	34g	34g
4	NaOH	18g	18g	18g
5	Natural Himalayan Pink Salt	1g	1g	1g
6	Tea Tree Oil	8g	8g	8g
7	Cocoa Butter	14g	-	-
8	Shea Butter	-	14g	-
9	Mango Butter	-	-	14g

3. FINDINGS

Table 3.1: Physical Appearance of Soap

Days	Physical Appearance

	Formulation 1	Formulation 2	Formulation 3
Day 1	Smooth soap and have a uniform texture	Rough texture with visible white granules	Rough texture with visible white granules
Day 2	White granules can be seen	White granules can be seen	White granules can be seen
Day 7	White granules can be seen	White granules slowly disappear	White granules slowly disappear
Day 14	White granules can be seen	Only a few White granules can be seen	White granules slowly disappear

All soaps remain stable during storage from day 1 to day week 4 as no changes of shape occur. Therefore, palm oil can be used as natural yellow color, and the presence of antioxidants may help in terms of color stability (Ahmad, 2021). In this study, shea butter is the best formulation because it has the smoothest texture for bar soap and easy to handle during packaging. The sense of tea tree oil and palm oil can be detected using sense of smell. Tea tree oil, with its invigorating and refreshing scent, carries notes of earthiness and a hint of medicinal aroma. It has often been praised for its potential therapeutic properties. On the other hand, palm oil brings a unique fragrance to the table, characterized by its mild and subtle scent. The aroma of palm oil can be reminiscent of fresh greens and a touch of nuttiness.

Table 3.2: pH and Viscosity Test

Test	Formulation 1	Formulation 2	Formulation 3
pH Value	9.60	9.71	9.52
Viscosity Measurement (cP)	6.5	10.5	3.5

Soap with saponification reaction is naturally alkaline due to the presence of sodium hydroxide components as the base material. Even though the pH value of the soap is too alkali, all the formulated soaps fall within the accepted limit pH range in the range of 4-10. A liquid's flowability is measured by its viscosity, lower viscosity indicates a more flowable liquid.

Table 3.3: Foam Height Test

Parameter	Formulation		
	Formula 1	Formula 2	Formula 3
Foam height 10 Strokes	80ml	78ml	95ml
Foam height 25 Strokes	95ml	90ml	> 100ml

All soaps were acceptable as per Indian standard soaps stated soaps should be produce foam of at least 100ml in 50 ml distilled water. In general, good and stable foam is one of the important attributes for effective cleansing action by soaps.

Table 3.4: Foam Retention

Time in minute	Foam retention		
	Formulation 1	Formulation 2	Formulation 3

0	80ml	78ml	95ml
1	80 ml	78ml	95ml
2	79 ml	76ml	93ml
3	78ml	76ml	92ml
4	77ml	76ml	92ml
5	77ml	76ml	92ml

Formulation 3 has the highest foam height meanwhile formulation 2 have the most stable foam produced as demonstrate the longest foam stability.

Table 3.5: Total Fatty Matter

Formulation	**Formulation 1**	**Formulation 2**	**Formulation 3**
Weight of Dish	113.45g	109.6g	114.13
Weight of Dish + Soap After Drying	116.78	113.17	117.82
TFM	66.6%	71.4%	78.8%
Grade	Grade 3	Grade 2	Grade 2

Total quality matter describes the quality of the soap, the higher the TFM, the higher the quality of soap.

Table 3.6: Moisture Content

Parameter	Formula 1	Formula 2	Formula 3
Moisture Content at 100°C	8.4%	9.8%	10.6%

The lesser the moisture content more is the stability of the formulation thus in this research, formulation 1 is the most stable in moisture content.

4. DISCUSSION

All soap formulations exhibited stability during storage from day 1 to day 14, with no noticeable changes in shape as presented in Table 3.1. Consequently, palm oil serves not only as a natural yellow coloring agent but also contributes to color stability due to its antioxidant properties (Ahmad, 2021). Formulation analysis reveals distinct textural characteristics among the formulations. Tea tree oil, renowned for its invigorating and refreshing aroma, emanates earthy notes with a subtle medicinal hint, often lauded for its therapeutic potential. In contrast, palm oil exudes a mild and subtle fragrance reminiscent of fresh greens with a touch of nuttiness. The pH determination process involves triplicate measurements to ascertain an average pH value for each sample. According to Table 3.2, formulation 3 displays the lowest alkali pH of 9.52, followed by formulation 1 at 9.60, while formulation 2 records the highest pH at 9.71. Although all formulations exhibit an alkaline pH, falling within the acceptable range of 4-10 prescribed by SNI (2588: 2017), it's noteworthy that prolonged skin contact with highly alkaline soap may lead to skin irritation (Ahmad, 2021). Table 3.2 shown comparison of viscosity test Formulation 3 has the best result as the formulation has the lowest viscosity 3.5 cP followed by Formulation 1, 6.5 cP, meanwhile formulation 2 have the highest viscosity

10.5cP. The duration for which soaps retain their foam is termed foam retention time. In this study, all soaps maintain stable foam height after 5 minutes, indicating satisfactory and stable lather-producing ability. Table 3.4 illustrates the foam retention test, with formulation 3 demonstrating the longest foam stability. The total fatty matter (TFM) of the soap as in Table 3.5, indicative of its quality, varies across the formulations, with formulation 3 exhibiting the highest TFM of 78.8%, falling under grade 1 soap classification according to ISO standards (Ahmad, 2021). Moisture content testing aims to measure the water content in solid soap after drying. Results from Table 3.6 reveal varying moisture content among the formulations, with formulation 1 displaying the lowest moisture content at 8.4%, indicating enhanced stability. Exceeding permissible moisture content may lead to soap deterioration (Sindhu et al., 2019).

5. CONCLUSION

Based on the formula provided and the extensive range of evaluation tests conducted in this project, any formulation can be chosen for soap crafting, regardless of the emollient employed, whether it's cocoa butter, mango butter, or shea butter. Users are recommended to adhere precisely to the provided recipe to ensure the production of high-quality handmade soap. Following a thorough examination of test outcomes, cocoa butter emerges as the prime choice for handmade soap, exhibiting greater stability and suitability compared to shea butter and mango butter in formulations.

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