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Optimizing Moisture and Color: A Comparative Study of Lip Balms Formulated With Raspberry Seed Oil and Coconut Oil

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Abstract

Lip balm is one of the most often used cosmetics to improve the appearance of consumers among a wide range of cosmetics. In this study, organic lip balms were made with raspberry seed oil and coconut oil as the key ingredients using a hot boiled method involving a developed formulation that is effective in moisturizing and protecting the lips using evaluation parameters such as physical appearance, spreadability test, measurement of pH, and moisture analysis. The lip balm was produced with three basic ingredients and two additional ingredients: beetroot coloring for four samples and blueberry coloring for four other samples using raspberry seed oil and coconut oil. Sample H with ratio of raspberry seed oil to beetroot powder of 4:1 was the most effective recipe due to low moisture loss percentage of 0.0331%. Besides, its pH value is measured at 4-5 which corresponds to the skin's physiological pH.

1. Introduction

In the present era, lip balm and other cosmetics are becoming popular choices among consumers since they cater to their personal hygience and cosmertics needs. However, the majority of commercial lip balms on the market now contain some chemicals preservatives, moisturizing, antibacterial qualities, and color and aroma attraction, including phenol, salicylic acid, menthol, synthentic scent, and petroleum jelly. If these substances are used repeatedly and for an extended period, they maycause side effects like dryness and irritation of the lips. Therefore, the product 'going green' is growing popular in practically every industry, including the cosmetics industry, as a way to live a more natural and healthy lifestyle which is can lessen pollution to the environment and the consumption of non-renewable natural resources. The usage of organic cosmetics in personal care products has increased far too rapidly. Compared to synthetic chemicals, organic compounds have been proven to exhibit pharmacological features such as cytosis, antibacterial, and anti-inflammatory effects for thousands of years, making them a valuable addition to traditional medicine practices worldwide [1].

This project aimed to research organic lip balm in deeper detail. This was based on a thorough analysis of the research on organic lip balm and the significance of incorporating natural excipients into lip balm formulation and testing. In this experiment, a lip balm was made using natural raw ingredients, and its stability was evaluated by assessing its organoleptic qualities such as color, look, and odor, spreadability test, and measuring its melting

point. The color of a product also can reveal insight into its freshness and quality. On the other hand, natural colors from organic raw materials are less dangerous than synthetic ones [2].

Raspberry seed oil and coconut oil were selected as a moisturizing agent with other ingredients like shea butter, beeswax, and honey. The raspberry seed contains anti-fungal, anti-bacterial, and natural oxidant properties, making it an ideal addition to lip balm formulation. Linoleic and linolenic are two primary essential fatty acids found in raspberry seed oil [3]. Due to its composition, raspberry seed oil works well with face, lip, and sunscreen products, which gives it great anti-inflammatory properties. It also decreases the impacts of photoaging, atopic dermatitis, and psoriasis while enhancing the skin barrier function [4]. Coconut oil is another essential natural component utilized in the creation of natural lip balm. It also has antibacterial qualities that help prevent lip infections. Vitamin E, an antioxidant, helps protect the lips from oxidative damage caused by free radicals. It also has moisturizing properties and promotes the healing of dry, chapped lips [5].

Lip coloring is an age-old method for improving lip beauty and adding a lovely touch to facial cosmetics. The variety of color tones, textures, and lusters has been expanded upon and altered in response to this. Natural lip balm manufacture is the most popular cosmetic product used to enhance the beauty and dazzling gloss of lips.

A natural method to promote hydrated, healthy lips is to use lip balms. The foundation of contemporary cosmetic lip products is the use of hazardous substances with a wide range of unfavorable effects. It is crucial to research the natural components used to create lip balm [6]. Thus, beetroot and blueberry were selected as coloring agents for lip balm production. Beetroot has become popular functional years due to all of its health benefits. Additionally, it includes phenolic compounds that are well-known for their antioxidant properties. In addition to being used as food, it serves as a medical herb and natural food coloring . Blueberries are known for their color choices because they contain anthocyanins, a type of water-soluble flavonoid pigment that may take on different colors depending on the pH of their environment [7].

2. Materials and Method

The materials and method used in this project were discussed as in the following sub-topics.

2.1 Materials

In this formulation of organic lip balm, there are going to be eight samples: Sample A, Sample B, Sample C, Sample D, Sample E, Sample F, Sample G, and Sample H. The ingredients that are going to be used in the making of the samples are beeswax (3.0 g), shea butter (4.0 g), honey (6.0 g), raspberry seed oil (2.0 g for samples A and B, 4.0 g for samples C and D), and blueberry (1.0g for Sample A, C, E, and G), coconut oil (2.0 g for Sample E and F, 4.0g for Sample G and H), beetroot powder (1.0g for Sample B, D, F, and H) as following in Table 1. The apparatuses are a crucible, Bunsen burner, tripod furnace, wire mesh, and glass rod [2], [8].

Table 1 *The compositions of each sample*

Composition (g)	A	B	C	D	E	F	G	H
Beeswax	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Honey	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Shea Butter	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Raspberry Seed Oil			2.0	4.0			2.0	4.0
Coconut Oil	2.0	4.0			2.0	4.0		
Blueberry Powder	1.0	1.0	1.0	1.0				
Beet Root Powder					1.0	1.0	1.0	1.0

2.2 Formulation of The Organic Lip Balm

Distilled water is used to rinse the equipment before producing lip balm. The components, which include 3.0g of beeswax, 4.0 g of shea butter, 6.0 g of honey, 2.0 g of raspberry seed oil, 2.0 g of coconut oil, and 1.0g of powdered blueberries and beetroot, are all weighed following the specifications. Equipment such as a tripod furnace, wire mesh, and Bunsen burner are arranged. The crucible is filled with the measured components. Mix the components in the crucible using a glass rod until they melt and combine uniformly after lighting the Bunsen burner. The liquid lip balm is blended and then placed in a container. Then, let it sit at room temperature for an hour to ensure adequate hardening. The stages are repeated depending on the material needed to prepare further samples. In each container, 2.0 g of coconut oil was added for samples A and E, 4.0 g of coconut oil for samples B and F, 2.0 g of raspberry seed oil for samples C and G, and 4.0 g of raspberry seed oil for samples D, and H. Then, 1g each of beetroot root powder for samples E, F, G, and H and blueberry powder for samples A, B, C, and D into the mixture [2], [6], [9], [10]. The finished formulated lip balm in containers is shown in Fig. 1.

Multidisciplinary Applied Research and Innovation Vol. 6 No. 1 (2025) p. 177-183

Fig. 1 *Formulated lip balm samples in containers*

These eight samples, as shown in Figure 1, have been prepared in compliance with the prescribed procedure. Samples E, F, G and H are in the first row from the left, and samples A, B, C and D are in the second row from the left. Every one the eight samples is now in a container.

2.3 Evaluation of Lip Balm

It's critical to preserve a uniform quality for organic lip balm. Taking this into account, the lip balm's formulation will be assessed according to its pH value, spread ability, physical properties, and moisture analysis.

2.3.1 Organoleptic Properties

The formulation's physical characteristics, color, and scent were examined. Physical observation was used to assess these qualities. Texture and uniformity were examined by pressing a tiny amount of the formulation between the thumb and index finger. The texture and homogeneity of the formulations were assessed using the presence of coarse particles and consistency. Evaluations were also made on the skin's feel, which included grittiness, greasiness, and stiffness [2], [11].

2.3.2 Spread Ability Test

Glass slides were used to observe spread ability. The formulation was dispersed at room temperature (25.0±3.0 °C) across the slides and placed between two slides before the load was applied. Visual observation was done on the consistency of the layer's formation [1], [9], [11], [12]. The following standards were set for this test according to Table 2:

Table 2 *Observation standards for spread ability test*

Symbol	Indication	Explanation
G	Good	Perfect application, no deformation of the lip balm; uniform, leaves no fragments.
I	Intermediate	Proper application, uniformity, minimal fragmentation, and minimal deformation of the lip balm.
B	Bad	Intense deformation of lip balm; difficult or inappropriate application; not uniform, leaving many fragments.

2.3.3 pH Measurement

The pH of the organic lip balm formulation will be measured with a pH meter. A buffer solution will be used to calibrate the pH meter. The objective was to keep the pH of the lip balm as near to neutral as feasible while investigating any possible drawbacks [1], [12]. A decent lip balm should have an acidity level close to the pH of the lip skin, which is often about pH 4 – 5 [13]

2.3.4 Moisture Analysis

The lip balm's level of moisture determined how hydrated it was. The lip balm was weighed, and the sample's moist weight was noted. Next, the wet sample was dried in an oven set to 70 °C for an hour. The sample was then left in the desiccator for an hour to cool to room temperature. The sample was weighed one more time to find its dry weight [11]. The weight percentage (W%) formula were used to determine the sample's moisture content:

$$W\% = \frac{(A - B)}{A} \times 100\% \quad (1)$$

According to this formula, W% is the amount of moisture lost to the environment after the oven is used. The sample's wet weight, or initial weight, is represented by A, while the sample's dry weight, or final weight, is represented by B.

3. Results and Discussion

3.1 Organoleptic Properties

The eight samples are determined by their colors, tastes, and smells during this stage. Eight formulations have been developed so far. All eight formulation samples undergo tests to observe color, taste, and odor. The results are according to the Table 3.

Table 3 *Physical appearance test for each sample*

Parameters	A	B	C	D	E	F	G	H
Color	Pale green	Pale green	Pale green	Green	Red	Red	Red	Red
Odor	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant
Appearance	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth

According to Table 3, Samples A, B, C, and D have a pale green or green colour because they contain blueberry powder. This is because blueberries have anthocyanins. The lip balm turns out green because it is most likely related to the pH sensitivity and chemical interactions of blueberries' anthocyanin pigments. Plus, coconut and raspberry seed oils may include components that react with anthocyanins, resulting in colouring [7]. Raspberry seed oil, for example, contains tocopherol, which may affect pigment stability. The result colour for samples E, F, G, and H is red because it is mixed with beetroot powder even though coconut oil has a yellow colour. This is because beetroot has a high concentration of betanin[3] . This is a form of betalain pigment. Beetroot's deep red colour is due to a high concentration of this pigment. Beetroot contains a high concentration of betanin, thus even when diluted, it keeps its intense red hue. This means that a small bit of beetroot extract can produce a vibrant colour that overpowers the other colours in the mixture [14].

Furthermore, the vanilla essence gives all of the samples a lovely odour. The fundamental component of vanilla's aroma is vanillin, a molecule that emits a sweet, creamy, and pleasant aroma. Vanillin is naturally present in vanilla beans and is responsible for the distinctive vanilla smell [7].

3.2 pH Measurement

The pH of the created organic lip balm was ascertained using a pH meter. There was a buffer solution used to calibrate the pH meter. The goal was to maintain the lip balm's pH as near to neutral as feasible. The results are according to Table 4.

Table 4 *pH Value and spread ability of each sample*

Parameters	A	B	C	D	E	F	G	H
pH	5.51	5.26	5.42	5.89	4.44	4.50	4.38	4.22
Observation	B	I	B	G	B	G	B	G

According to Table 4, samples E, F, G, and H exhibit low pH values because beetroot contain acidic qualities such as oxalic acid, citric acid, and malic acid. These acids are among the elements that influence the pH level of lip balm. However, they are still safe for the lips. According to Nur Insan & Vera, 2021, lip balms have a pH range of 4.5-6.5, which corresponds to the skin's physiological pH. This demonstrates that the lip balm compositions manufactured are safe and do not irritate the lips. The greater the concentration of beetroot (Beta vulgaris) utilized, the higher the pH of the recipe. Lip balm preparations have a pH range of 4.5-6.5, corresponding to the skin's physiological pH. The lip balm compositions are safe and do not irritate the lips [2].

3.3 Spread Ability Test

This is checked by repeatedly applying the product at room temperature to a glass slide. This allows us to see if the protective layer forms uniformly and to see if the product breaks, fragments, or deforms while being applied [1, 3, 6, 17]. The spreadability criteria are applied according to the Table 5.

According to Table 4, samples were tested at room temperature (25.0±3.0 °C). Good is consistent, no fragmentation; flawless application, no distortion of lip balm but Intermediate means even, leaves few fragments, appropriate application; little deformation of lip balm and Bad means intensely deforms lip balm; application is difficult or improper; not uniform and leaves many pieces. From the results, samples D, F, and H have a good

spread ability, sample B has an intermediate spread ability, and samples A, C, E, and G have a bad spread ability. This disparity in results is caused by factors such as the type and quantity of oil combined in each sample.

The smoothness of an oil on the skin is subjective and depends on individual preferences. Raspberry seed oil is considered smoother due to its light, non-greasy texture and quick absorption. It provides a silky feel due to its high polyunsaturated fatty acid content [15]. Coconut oil, on the other hand, is solid at room temperature but melts on contact with the skin, leaving a more pronounced oily layer. It may feel smooth to some but may be too greasy for others, especially those with oily or acne-prone skin [16].

3.4 Moisture Analysis

The moisture content of the lip balm dictated how moisturized it was. To determine the sample's dry weight, it was weighed once more and recorded. The formula (1) was used to determine the sample's moisture content. Table 6 shows the result of the moisture analysis below.

Table 5 *The Result of Moisture Loss for Lip Balm Samples*

Sample	Initial Weight (g)	Final Weight (g)	Moisture Loss (%)
A	10.349	10.338	0.1063
B	12.118	12.112	0.0495
C	11.019	11.010	0.0817
D	11.263	11.254	0.0799
E	3.837	3.830	0.1824
F	10.191	10.184	0.0687
G	8.512	8.503	0.1057
H	9.073	9.070	0.0331

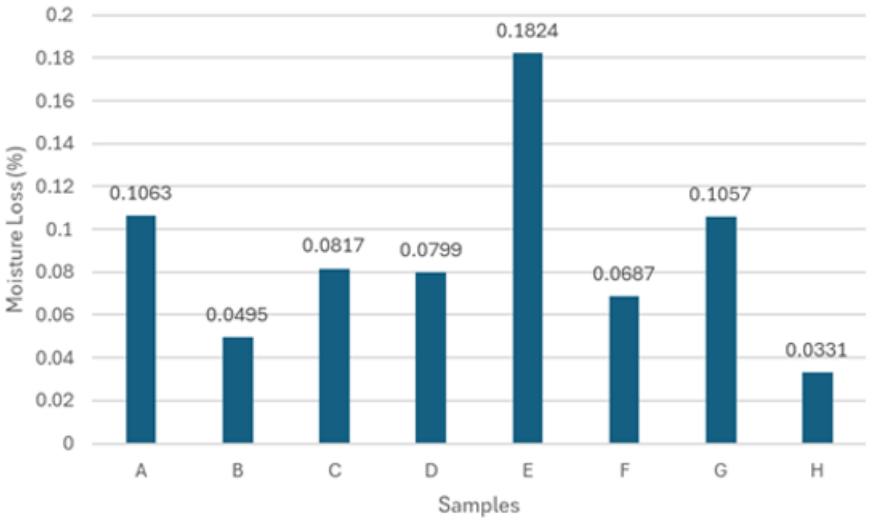

Fig. 2 *The Percentage of Moisture Loss of the Lip Balm Samples*

Based on Table 5 and Fig. 2, sample H has the lowest percentage of moisture loss, 0.0331% out of the eight samples that underwent the moisture loss test, and sample E has the highest percentage of moisture loss, 0.1824%. The composition of sample H, which includes raspberry seed oil as a key ingredient, demonstrates that when it comes to preventing moisture loss, raspberry seed oil outperforms the composition of sample E, which includes coconut oil due to its higher concentration of essential fatty acids, higher antioxidants content, superior emollient qualities, and more efficient skin absorption. Research has shown that low moisture loss is preferable since it signifies extended skin hydration. Products with a low transepidermal water loss (TEWL) impact assist in keeping skin hydrated for extended periods [15], [16].

4. Conclusion

Organic lip balm is considered a cosmetic product endeavor that can lessen environmental pollution and the consumption of non-renewable natural resources. Many lip-related health problems, such as irritation on the lip skin caused by the regular use of chemicals in commercial lip balm products, can be prevented by using this lip balm, which is made organically. Through this project, an organic lip balm that matched the required specifications for formulation and testing was successfully generated. Sample H which has 4:1 ratio of raspberry seed oil to

beetroot powder is the organic lip balm recipe that effectively demonstrates its efficacy. This formulation has a low moisture loss percentage of 0.0331%, which is shown that it has raspberry seed oil as a major component shows that raspberry seed oil works better than sample E's composition in avoiding moisture loss . Furthermore, sample H also has a pH value of 4-5, which corresponds to the skin's physiological pH and a good physical form which is it has a smooth appearance, pleasant odor, and red color, which is it is an attractive color that can attract consumers to use, and good spreadability, according to the findings of the parameter test.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design****: Shazana Hashim, Rozainita Rosley; data collection: Noor Afrina Hasni, Ku Nur Husna Afifah Ku Hasnan, Nurul Najihah Mohd Sabaruddin;* ***analysis and interpretation of results****: Ku Nur Husna Afifah Ku Hasnan, Noor Afrina Hasni, Nurul Najihah Mohd Sabaruddin;* ***draft manuscript preparation****: Nurul Najihah Mohd Sabaruddin. All authors reviewed the results and approved the final version of the manuscript. The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.*

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