



# ORGANIC LIP BALM FORMULATION USING OIL-BASED BIGNAY (*Antidesma bunius*) FRUIT EXTRACTS WITH CANTALOUPE (*Cucumis melo var. cantalupensis*) SCENT

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## ABSTRACT

This study formulated organic lip balms using the oil-based Bignay (*Antidesma bunius*) fruit extracts with Cantaloupe (*Cucumis melo var. cantalupensis*) scent and employed the true experimental design. In achieving the objectives of the study, the researchers followed the adopted but modified protocol from Laura Ascher (2020). Then the formulated organic Bignay lip balms were subjected to pH level testing and dermatological effect testing. After this, a comparative analysis was determined if there was a significant difference in the dermatological effect test between the treatment and control groups. Further, in formulating the organic lip balm, it utilized oil-based Bignay fruit extracts (7g), beeswax (7g), shea butter (7g), 30 drops of Cantaloupe scent, and 2 capsules of Myra-E, which were mixed with all together at a temperature of 385 degrees Celsius. Also, the pH level of formulated Bignay lip balms is 5.3 indicating safe for use on the lips. Additionally, a 24-hour dermatological test was conducted and revealed no sensitivity or adverse reactions among the human subjects. Moreover, the T-test analysis showed no significant difference between the treatment and control lip balm samples in terms of dermatological effects. Thus, both experimental and control products were found to be safe, with no discomfort, redness, or inflammation reported. So, the study concluded that the formulated organic lip balms using the oil-based Bignay fruit extracts are safe to use for the lips. Hence, it is recommended that future researchers may include conducting stability and shelf-life testing, exploring pigmentation improvement, and investigating additional applications of Bignay fruits beyond lip balm.

**Keywords:** *Organic Lip Balm, Formulation, Bignay Fruit Extracts, Cantaloupe Scent, Dermatological Effect Test, pH level*

## INTRODUCTION

Lip balms are cosmetic products that protect and moisturize the lips, preventing chapping and shielding them from environmental conditions. They contain ingredients like beeswax, shea butter, and coconut oil, which work together to soften the lips and create a protective barrier. Bignay fruit extracts, with their antioxidant and antimicrobial properties, enhance the moisturizing effects of lip balms. Additionally, the vitamin C in Bignay fruit contributes to

anti-aging benefits. Cantaloupe essential oil is often added for its pleasant fragrance and skin-friendly nature (Brazilian Journal of Pharmaceutical Sciences, 2013).

To ensure safety and quality, lip balms must undergo pH testing to determine their acidity or baseness, and dermatological effect testing to evaluate potential skin irritation or allergic responses. The aim of this study was to formulate an organic product that effectively treats chapped lips, especially during dry weather conditions.

### Objective of the Study

This study's main goal was to formulate organic lip balms using the oil-based fruit extracts of Bignay (*Antidesma bunius*) with Cantaloupe (*Cucumis melo var. cantalupensis*) scent. To attain this key goal, the researchers executed these procedures:

- 1.) Adopted but modified the protocol for the formulation of organic lip balms using oil-based Bignay (*Antidesma bunius*) fruit extracts with Cantaloupe (*Cucumis melo var. cantalupensis*) scent.
- 2.) Tested the pH level of the formulated organic lip balms using oil-based Bignay (*Antidesma bunius*) fruit extracts with Cantaloupe (*Cucumis melo var. cantalupensis*) scent.
- 3.) Tested the dermatological effect of the formulated organic lip balms using oil-based Bignay (*Antidesma bunius*) fruit extracts with Cantaloupe (*Cucumis melo var. cantalupensis*) scent.
- 4.) Determined the significant difference in the dermatological effect test between the treatment and control.

### Research Questions

Guided by the objectives of this study, the researchers sought answers to the following scientific questions:

- 1.) How were the organic lip balms using oil-based Bignay (*Antidesma bunius*) fruit extracts with Cantaloupe (*Cucumis melo var. cantalupensis*) scent formulated?
- 2.) What is the pH level of the formulated organic lip balms using oil-based Bignay (*Antidesma bunius*) fruit extracts with Cantaloupe (*Cucumis melo var. cantalupensis*) scent?
- 3.) What is the dermatological effect of the formulated organic lip balms using oil-based Bignay (*Antidesma bunius*) fruit extracts with Cantaloupe (*Cucumis melo var. cantalupensis*) scent?
- 4.) Is there a significant difference in the dermatological effect test between the treatment and control?

### Hypothesis of the Study

**Ho<sup>1</sup>** There is no significant difference in the dermatological effect test between the treatment and control.

### Scope and Delimitations of the Study

This research focused on formulating organic lip balms using oil-based Bignay (*Antidesma bunius*) fruit extracts with Cantaloupe (*Cucumis melo var. cantalupensis*) scent, considering its rich phytochemical components that promote lip moisture, preventing it from chapping and shielding it from environmental conditions. To attain the objectives of the study, the researchers first adopted but modified the protocol from Laura Ascher (2020) for making organic lip balms using oil-based Bignay (*Antidesma bunius*) fruit extracts with Cantaloupe (*Cucumis melo var. cantalupensis*) scent. Second, they tested the pH level of the formulated organic lip balms to know whether or not the products were suitable for use on the lips. Third, the researchers tested the dermatological effect of the formulated organic lip balms by allowing the selected respondents from the HUMSS Clarion and Cadavos section to try out the products for 24 hours. Lastly, using the results of the dermatological tests, the significant difference between the treatment and control was determined.

The study was conducted in the academic year 2022-2023 by the STEM students of Colon National High School, and the laboratory experiments were performed at the Nutraceutical Laboratory of Mindanao State University, General Santos City.

### Limitations of the Study

This research has limitations within which the findings need to be interpreted carefully. First, the mixing of Vanilla essential oil in the formulation failed, since the vanilla was water-based and the lip balm formulation was oil-based. Second, when formulating the organic lip balms using the Bignay powder, the texture came out rough. Lastly,

the uncontrolled change of the lip balm's color where the lip balm's appearance changes from pink to white during its curing time.

### Significance of the Study

**To Environmental Science**, this study could lead to new scientific discoveries and an eco-friendly solution for chapped lips.

**To Cosmetology**, this study explores Bignay fruit as an organic lip balm, offering a natural alternative to synthetic products of cosmetology.

**To Policy Implementation**, this study goes beyond safe policy and focuses on strict implementation for maximum effectiveness.

**To the Community**, this study formulated Bignay fruit lip balm that enriches lips with antioxidants, promoting healthier lips and benefiting the community.

**To the STEM Students**, this research empowers STEM students with more information, training, and decision-making to enhance their preparation and completion of the study.

**To Future Researchers**, the recommendations and literature review may guide them in finding relevant studies more easily.

### Research Gap

As of January 2022, there has been no research on the formulation of Bignay fruit extracts with Cantaloupe scent in lip balms or other cosmetic products. Thus, the researchers were pressed to formulate organic lip balms using the fruit extracts of Bignay with the scent of a Cantaloupe. Also, research gaps exist regarding the safety profile of lip balms containing Bignay fruit extracts and Cantaloupe scent. Hence, the researchers investigated the pH level of the formulated organic lip balms whether or not they were suitable for use on the lips, and evaluated their potential skin irritation, sensitization, or allergic reactions associated with these ingredients, particularly when used on lips.

### Conceptual Framework of the Study

The conceptual framework that was used in the study is the Input-Process-Output Model. The (IPO) framework was used to show the process of evaluating the formulated organic lip balms using oil-based Bignay fruit extracts with Cantaloupe scent. In the IPO model, a process is viewed as a series of tasks done in formulating and evaluating the organic lip balms connected by inputs i.e., the objectives: (1) adopted but modified the protocol for the formulation of organic lip balms using oil-based Bignay (*Antidesma bunius*) with Cantaloupe (*Cucumis melo var. cantalupensis*) scent, (2) Tested the pH level of the formulated organic lip balms, (3) Tested the dermatological effect of the formulated organic lip balms, and (4), Determined the significant difference in the dermatological effect test between the treatment and control, and the output is the evaluation results of the formulated organic lip balm using oil-based Bignay fruit extracts with Cantaloupe scent. According to Harris and Taylor (1997), information or material objects flow through a series of tasks or activities based on a set of rules or decision points. Flow charts and process diagrams are often used to represent the process. What goes in is the input, what causes the change is the process, and what comes out is the output (Armstrong, 2001).

The IPO model provided the general structure and guide for the direction of the study. Substituting the variables of this study on the IPO model, the researchers came up with the conceptual framework of the study as shown in Figure 1 on the succeeding page.

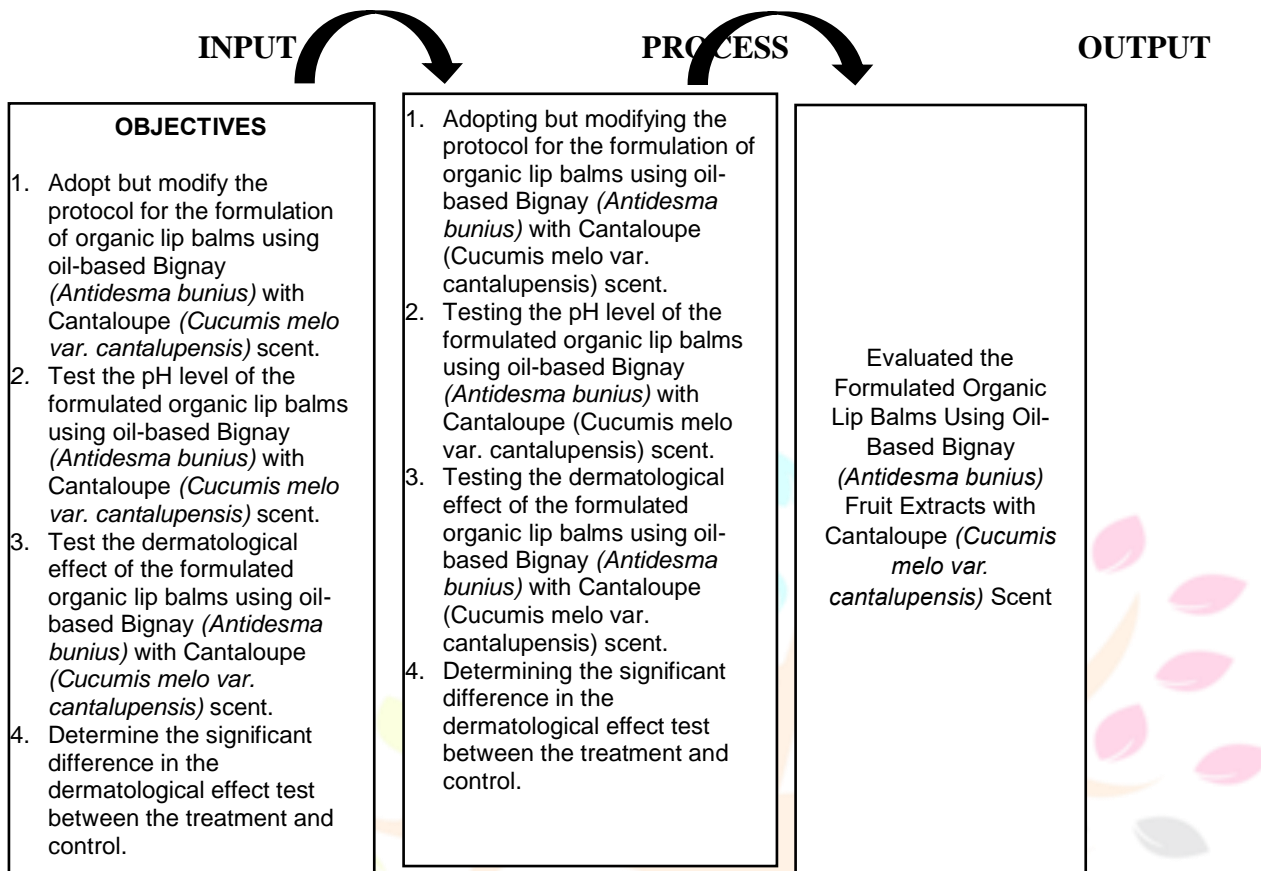


Figure 1. The Conceptual Framework of the Study

## METHODOLOGY

### Research Design

This study employed the quantitative method, particularly the true experimental design in providing answers to the research questions posed in this study. According to Pubrica-Academy (2022), experimental research is a type of scientific examination in which one or more independent variables are changed and then applied to one or more dependent variables to see how they affect the latter.

### Materials Used

Bignay fruit, Oil-based Bignay extracts, Beeswax, Shea butter, Virgin coconut oil Cantaloupe fragrance, pH strips, and Patch.

### Tools Used

Stirring rod, Spatula or Wooden spoon, Pixpro glass funnel, Lip balm tube, Beaker, Weighing Boat, Beaker Tongs, Scissors, Digital pocket Weighing Scale, and Tray

### Equipment Used

Hot plate, Blender, Analytical Balance, Dehydrator, and Laminar Flow

## Paraphernalia Used

Face Mask, Laboratory Gown, Gloves, Hairnet, and Laboratory Footwear

## Procedures

### A. Preparations of Materials

First, the researchers collected the materials (Bignay fruits) and then cleaned them using tap water two times to remove dirt and residues from the collection. Second, in the final washing of the Bignay fruits, distilled water was used. Third, after sanitation, they peeled the Bignay fruits separating the seeds, leaving only the pure fruit. Fourth, they air-dried the Bignay fruits. Fifth, the materials (Bignay fruits) were dehydrated through a laboratory dehydrator and were left overnight for about 75°C to reduce their moisture content. Sixth, when the moisture content was reduced, the researchers proceeded to grind the materials using a NutriBullet blender and soaked them (powdered Bignay fruit) using a total of 130mL virgin coconut oil for 45 days. Seventh, after 45 days, the mixture of Bignay-Coconut oil was processed through filtration to generate the oil-based extracts of Bignay fruits.

### B. UV Sanitation

After extracting, the researchers placed the extracted oil-based Bignay fruits into the laminar flow for disinfection to avoid any contaminations/bacteria infestation.

### C. Testing the pH Level of Oil-Based Bignay Fruit Extracts

Panther and Jacob (2015) state that the compatibility of a lip balm with the epidermis is influenced by its pH level. Typically, the pH equilibrium of the lips is between 4.0 and 7.0. By ensuring that the pH of the lip balm formulation remains within this specified range, testing for irritation, dehydration, or other unfavorable reactions on the lips is effectively prevented. Additionally, the pH of a lip balm can affect its protective and moisturizing properties. By designing the lip balm to fall within the ideal pH range, it guarantees the preservation of the skin's inherent barrier function, the retention of moisture, and the provision of efficacious hydration and nourishment to the lips. Hence, researchers subjected the extracted oil-based Bignay fruits to pH testing using the pH strips. Three (3) trials were done before an average result was determined for the pH level of the formulated lip balms using oil-based Bignay fruit extracts.

### D. Formulation of Organic Lip Balms

The researchers followed the adopted but modified protocol from Laura Ascher (2020) in formulating organic lip balms using oil-based Bignay fruit extracts. First, they measured the beeswax, shea butter, and oil-based Bignay fruit extracts with a ratio of 1:1:1 of 7 grams, respectively. Second, they melted the beeswax and shea butter, added the oil-based Bignay fruit and while stirring continuously added 30 drops of Cantaloupe essential oil as its scent. Third, they cut 2 capsules of Myra E and squeezed its contents into the mixture, then stirred it until it was well mixed. Lastly, they filled up the lip balm containers with the mixture, and let it cool down at room temperature for a few minutes.

### E. Testing the Irritation of the Formulated Organic Lip Balms (Dermatological Effect Test)

In determining the irritation of the formulated organic lip balms using oil-based Bignay fruit extracts, the researchers utilized the patch test method. In successfully doing this method, they first gathered all the needed materials such as alcohol, patches, tissue papers, plasters, and scissors. Second, they determined ten (10) respondents from the Humanities and Social Science (HUMSS) strand specifically Grade 12 Cadavos for the experimental/treatment group, encompassing 5 boys, and Grade 12 Clarion for the control group, composed of 3 boys and 2 girls, whose parents voluntarily signed the consent to allow their children to participate in the study's testing.

Furthermore, the patch test commenced by cleaning/disinfecting the side of the neck area of the respondents using alcohol with cotton balls. Then, the researchers applied a thick layer of lip balm i.e., Black Water for the control while for the experimental/treatment group, it was the formulated organic lip balms on the surface of the respondents' neck. Next, they applied the patches. Once these steps were executed properly, they instructed the respondents not to remove the patches and secure them for 24 hrs. After the period of waiting, the researchers observed the respondents' skin for possible signs of irritation or itchiness that occurred.

### Variables of the Study

The independent variable of the study was the formulated organic lip balms using oil-based Bignay (*Antidesma bunius*) fruit extracts with Cantaloupe (*Cucumis melo var. cantalupensis*) scent, while the dependent variables of the study were the pH level and the dermatological effect test (Test of Irritation). On the other hand, the control variable of the study was a commercial lip balm i.e. Black Water.

### Data Gathering Techniques

The researchers determined the pH level of the oil-based Bignay fruit extracts using a universal indicator paper and litmus paper to measure their pH level and acidity by Chemistry Libretexts (2023). For the irritation test, the researchers used a patch test. One (1) represents there is no irritation and two (2) represents there is an irritation.

### Statistical Analysis

This study determined the significant difference in the dermatological effect test between the treatment and control using a T-test at a 0.05 level of significance.

## RESULTS AND DISCUSSIONS

### Formulation of Organic Lip Balms

The researchers adopted the protocol from Laura Ascher (2020) but modified it by changing the powder Bignay into oil-based fruit extracts. They peeled the fruit, dried the skin, pulverized it, and immersed it in coconut oil for 45 days. Then, they tested the pH level of the oil-based Bignay extracts. Next, they measured the beeswax, shea butter, and Bignay fruit extracts with a ratio of 1:1:1 of 7 grams, respectively. Thereafter, they melted the beeswax and shea butter, added the oil-based Bignay fruit extracts and 30 drops of Cantaloupe scent, and mixed everything thoroughly. After which, they added the contents of two Myra-E capsules as vitamin E and continued stirring. Finally, they filled up lip balm containers with the mixture, and let it cool at room temperature.

### pH Level of Formulated Bignay Lip Balm

This study tested the pH level of the formulated Bignay lip balm. To determine its pH level, a pH meter was used. The results below indicate the pH level of the formulated Bignay lip balm.

**Table 1. pH Test Results of Formulated Bignay Lip Balm**

SAMPLE	REPLICATE	pH
Formulated Bignay Lip Balm	R1	6
	R2	4
	R3	6
	<b>Average: 5.33</b>	

The results show that the formulated lip balm has a pH of 5.33, indicating its suitability for being non-acidic and therefore safe for use on the lips. pH is a scale from 0-14 to measure acidity or alkalinity. Skincare products with lower/higher pH than the skin's natural pH can irritate or cause dryness. The ideal pH for cosmetic products is 4.5-7 to avoid irritation (Wasitaatmadja, 2011).

### Dermatological Test of the Formulated Organic Lip Balm

This study conducted a dermatological test of the formulated organic lip balm using Bignay (*Antidesma bunius*) Fruit Extracts through a patch test. This test was a diagnostic exam that the researchers used to determine whether formulated organic lip balm resulted in skin irritation or an allergic reaction. It utilized 5 students from HUMSS Clarion (Treatment Group) and 5 students from HUMSS Cadavos (Control Group) who willingly participated to be the subjects of the testing. The formulated organic lip balm was applied to their necks for 24 hours of observation. Table 2 below shows the results of the patch test.

**Table 2. Results of Patch Testing**

CONTROL	TREATMENT
1	1
1	1
1	1
1	1
1	1

**Legend:** 1 denoting the absence of irritation, 2 denoting the presence of irritation

The results show no irritation in both treatment and control products. It implies that both are gentle and safe to use for the intended purposes.

To test for irritation, lip balm was applied to the skin for three days with no observed erythema, papules, vesicles, or edema reactions. This procedure helps prevent dangerous reactions before applying to the lips (Nigam, 2010; Permatananda, Kristin, Endharti, Pinzon, & Sumada, 2018).

### Significant Difference in the Dermatological Test Between the Treatment and Control

After the dermatological test was done, the researchers subjected the results to statistical treatment and analysis to determine the significant difference in the dermatological test results between the treatment and control groups. Using T-test, table 3 below shows the generated results.

**Table 3. The Difference in the Dermatological Test Between the Treatment and Control Groups**

	CONTROL	TREATMENT
Mean	1	1
Variance	0	0
Observations	5	5
Hypothesized Mean Difference	0	
Df	4	
t Stat	1	
P(T<=t) two-tail	0.1	
t Critical two-tail	2	

Based on the result, the statistical analysis shows no significant difference between the treatment and control groups. This means that both the formulated organic lip balm (treatment) and commercial lip balm (control) showed the same dermatological effect of being suitable for use on the lips since no irritation was observed from the human subjects after 24 hours of application.

The result shows no difference from the study of Nor (2020). The study found that the tested lip balm was similar to retail lip balms in color, pH, and greasiness. Lip balms stored at room temperature had better quality. Sensory analysis

showed no significant difference between lip balms. Beetroot is a suitable herbal colorant for lip balms and other cosmetics.

## Summary of Findings

The formulation of the organic lip balm using oil-based Bignay (*Antidesma bunius*) fruit extracts was successfully accomplished by following the adopted but modified protocol from Laura Ascher (2020). The ingredients in the formulation included the oil-based Bignay fruit extract (7g), beeswax (7g), shea butter (7g), 30 drops of Cantaloupe scent, and 2 capsules of Myra-E, which were mixed all together at a temperature of 385 degrees Celsius. Also, the pH level of the formulated Bignay lip balms is 5.3 indicating safe for use on the lips. Furthermore, to determine whether or not the formulated organic lip balm would irritate the lips, it underwent a dermatological effect test through a patch test. It was found that the formulated organic lip balms did not cause any irritation on the skin of human subjects after 24 hours of application. Also, to compare the formulated organic lip balm with the commercial lip balm available in the market, a comparative analysis was done using T-test, and it revealed that both the treatment and control groups demonstrated the same property of being suitable for the lips for it had caused no irritation on both sample groups of human subjects when the dermatological effect test was performed.

## Conclusion

Based on the findings of the study, it can be concluded that the formulation of the organic lip balms using oil-based Bignay (*Antidesma bunius*) fruit extracts was successfully accomplished by following the adopted but modified protocol from Laura Ascher (2020). Also, since the pH level of the formulated lip balms is within the acceptable range for cosmetic products, it is, therefore, safe to use on the lips. Furthermore, the formulated organic lip balms caused no irritation on the lips when a dermatological effect test was done; hence, it is safe to use on the lips. Additionally, the results of the comparative analysis indicated that both the formulated organic lip balms and the commercial lip balm have the same property of being suitable for the lips.

## Recommendations

Guided by the findings and conclusions of the study, the researchers suggest that:

1. Stability and shelf-life testing may be done by future researchers.
2. Future researchers may add pigment to lip balm.
3. Future researchers may expand the investigations on Bignay fruit.

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