Bio-Lip Care

Engineering a pH-Responsive Hydrating and Healing lip oil using Jamaica and Pomegranate Extracts

A Research Paper Presented to

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Introduction

Are your lip products truly meeting to your skin's needs, or are they just temporary fixes? Recent research indicates that over 60% of consumers are actively seeking natural, long-lasting lip solutions that also support skin health and healing. This is especially important because many conventional lip products contain synthetic chemicals that can cause irritation or dryness, failing to provide real nourishment or healing. The problem is that most products only offer superficial color without addressing the underlying health of the lips. My project addresses this gap by developing an all-natural, inclusive bio-lip oil that dynamically changes color based on each person's unique pH levels, while simultaneously hydrating and healing lips—creating a sustainable, effective, and eco-friendly solution that prioritizes both health and environmental responsibility. This highlights the urgent need for innovative, personalized products that go beyond superficial color, offering real benefits tailored to individual skin chemistry.

(Source: Mintel Global Beauty & Personal Care Market Report, 2023).

Lip products are known as one of the most used and important step in a makeup routine. My project is aimed to create a Bio-Lip oil that is inclusive and beneficial to everybody by using Jamaica and Pomegranate extracts as my main components. I decided to create this lip oil to prove that an anti-microbial health promoting lip oil can be created by two very potent ingredients.

I created this lip oil by taking the extracts of Jamaica and Pomegranate and proceeded to measure all ingredients that helped create this lip oil by adding in coconut oil, tea tree oil, pomegranate oil, and jojoba oil. Then using a warm bath to get the Jamaica extract out of the flower and afterwards mixed all ingredients and placed the product in an applicator bottle concluding to an oil-based bio-lip oil. Afterwards, I proceeded to test my bio lip oil using 2 petri-dishes and combined my bio-lip oil with Staphylococcus epidermidis. And put the petri-dishes into an incubator at 37 degrees Celsius for 24 hours and discovered that my bio-lip oil is confirmed as a successful anti-microbial product.

I found out that Jamaica and Pomegranate make a very effective lip oil from all the components these ingredients provide also including its beneficials containing what makes it anti-microbial, inclusive, and health promoting.

Key words: Jamaica, Pomegranate, Anti-microbial, Lip-oil, Inclusive, Health Promoting

Background Research

Cosmetic products, especially those applied frequently, are susceptible to microbial contamination due to their composition and manufacturing processes. Many cosmetics contain components that foster microbial growth, as they are often produced without rigorous sterilization, which increases the risk of microbial and heavy metal contamination (PMC.ncbi.nlm.nih.gov, n.d.). Studies have demonstrated that common cosmetic items used daily can harbor harmful microbes and contain toxic metals, posing potential health hazards to consumers (Nature, 2022). This highlights the importance of monitoring cosmetic safety and improving manufacturing standards to reduce contamination risks and ensure consumer health.

In addition to safety concerns, the cosmetic industry has faced criticism for its lack of diversity and inclusivity, which affects consumer perception and representation. Traditional formulations often fail to meet the diverse needs of all users, creating an inclusivity gap that leaves many feelings unrepresented (BobbyShay, n.d.; Satori Laser, n.d.). Furthermore, the development of cosmetic products such as lip oils involves complex chemical interactions, such as pH-sensitive dyes that react with skin acidity to produce personalized color changes (RMS Beauty, n.d.). While innovative, some ingredients in lip oils, like titanium dioxide nanoparticles, pose health risks, including potential carcinogenicity when inhaled (Typology, n.d.), emphasizing the need for safer formulations and inclusive product development aligned with consumer safety and diversity requirements.

Introduction

Most cosmetic products contain several components that are favorable for microbial growth since they are not often manufactured in a media that is sanitized against microbial growth.

1. Reference: https://pmc.ncbi.nlm.nih.gov/articles/PMC10661125/

Conclusion

The study showed that many cosmetic products were used daily, and microbial and heavy metal contamination was found in many of the tested cosmetic products.

2. Reference: https://www.nature.com/articles/s41598-022-21771-7

The Inclusivity Gap in Traditional Cosmetic Products: Why It Matters and What Can Be Done

In conclusion, traditional cosmetic products often fail to cater to the diverse needs of many, leaving them feeling left out and not represented.

3. Reference: https://bobbyshay.com/blogs/news/the-inclusivity-gap-in-traditional-cosmetic-products-why-it-matters-and-what-can-be-done?srsltid=AfmBOoqa3JKsPhOajUuqzOloGnWZ5I3bEWetaaBgOvcIUefo3_IUpsZp

Inclusivity in the Beauty Industry

The beauty industry is one of the largest and most influential industries globally, with millions of consumers worldwide. However, it has been criticized for its lack of diversity and inclusivity, which has left many people feeling excluded and unrepresented.

4. Reference: https://www.satorilaser.com/blogs/laser-at-satori/inclusivity-in-the-beauty-industry?srsltid=AfmBOorccPlhfDhz7Q7DQotRAtHYGk8xGfeoYP9qNTQwJ__2Or5Pjnpb

How Does pH-adjusting Color Work

Human skin has a slightly acidic pH, generally around 5.5. When pH-sensitive dyes come into contact with your lips, they react with this acidity. The result is a color transformation that varies from person to person.

5. Reference: https://www.rmsbeauty.com/blogs/news/how-does-ph-adjusting-lip-color-work?srsltid=AfmBOoq65Z2ZZuZABHZmZbdpABo_yt0MvKFkMi2mfcqYiIks32SoiUws

What is Lip Oil?

Lip oils are lip products infused with oil-based ingredients that are designed to hydrate lips and give them glossy, glass-like shine.

6. Reference: https://www.charlottetilbury.com/us/secrets/what-is-lip-oil?srsltid=AfmBOoqVsGklS-OGMVLQilUKqGgXWW8sk-0_CJFRUWyLQxEoyuQ0H_Up

What Does Lip Oil Do?

The main uses of a lip oil are threefold: lip color, lip care, and lip glow. A good lip oil will stack the benefits of skincare and makeup, providing hydration and help with dry, dehydrated lips via hydrating, nourishing skincare ingredients like hyaluronic acid or vitamin E while also coating them with a glazed, glossy tint for enhanced color and shine.

7. Reference: https://www.charlottetilbury.com/us/secrets/what-is-lip-oil?srsltid=AfmBOoqVsGklS-OGMVLQilUKqGgXWW8sk-0_CJFRUWyLQxEoyuQ0H_Up

The potential dangers of tinted lip oils and the ingredients to avoid

Some tinted oils also contain **dyes in the form of nanoparticles such as titanium dioxide** (I.N.C.I.: CI 77891). In 2006, the International Agency for Research on Cancer (IARC) classified titanium dioxide (TiO2) in the **group of substances "possibly carcinogenic to humans"** (Group 2B): when inhaled, regardless of the particle size (nano or not).

8. Reference: https://us.typology.com/library/are-there-any-dangers-associated-with-the-use-of-a-tinted-lip-oil

Saltair Lip Oil Balm under the spotlight

Some lip oils may contain synthetic oils that can actually strip your lips of their natural oils, leaving them even drier than before. Additionally, some lip oils may contain preservatives and other additives that can be harmful to your lips in the long run.

9. Reference: https://thetruthaboutcosmetics.com/articles/saltair-conditioning-lip-oil-balm-controversial-ingredients/

Top 10 Lip Oil Manufacturing Trends and Innovations in 2024

The lip oil market has grown significantly, driven by consumer demand for multifunctional beauty products that combine hydration and color. Innovative products such as tinted lip oils and

color-changing formulas are gaining traction, appealing to consumers seeking versatility and ease of use

10. Reference: https://xirancosmetics.com/top-trends-in-lip-oil-manufacturing/

STATEMENT OF THE PROBLEM

General Problem:

This research aims to develop a bio lip oil utilizing Jamaica and pomegranate as the primary ingredients to make a pH-responsive hydrating lip oil addressing the need for natural, nourishing, inclusive, and eco-friendly lip care solutions. It seeks to explore the synergistic effects of these botanicals in enhancing lip hydration, protection, and overall health, while promoting sustainable sourcing and formulation practices within the cosmetics industry.

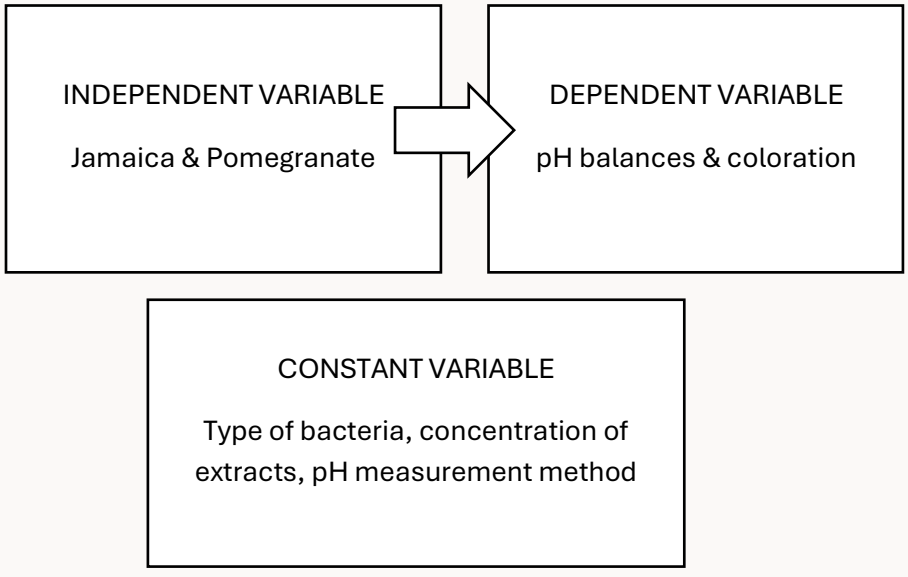
Specific Problem:

1. How do Jamaica flower extract and Pomegranate extract influence the moisturizing and healing properties of a bio-lip oil?
2. How do Jamaica and Pomegranate bio-lip oils compare to commercial lip oils in terms of efficacy and safety?
3. What are the potential anti-microbial or anti-inflammatory effects of Jamaica and Pomegranate components in lip care

PREDICTION

Using Jamaica and Pomegranate as the main components to create a bio-lip oil will result in a highly effective pH-responsive and hydrating product. Jamaica provides anthocyanins crucial for pH sensitivity, along with rich contents of vitamins and minerals that support overall lip health. Pomegranate offers potent antioxidants, natural coloration, enhanced hydration, and healing properties contributing to the oil's regenerative effects. This combination not only creates an eco-friendly and beneficial lip product but also provides a natural adaptive solution that promotes long-term health and nourishment.

VARIABLES



The natural extracts used in the formulation—½ teaspoon of Jamaica flower extract, ½ teaspoon of pomegranate extract —provide rich concentrations of antioxidants, polyphenols, and natural pigments. These bioactive compounds enhance coloration, support lip protection, and promote overall skin health. Their chemical properties help stabilize the product while delivering gentle, plant-derived functional benefits.

Figure 1: Chemical properties of natural Botanical extracts (images taken by the student researcher)

The lip oil was prepared by blending 1 teaspoon of jojoba oil and coconut oil with 1 teaspoon of pomegranate seed oil to establish a nourishing base. Into this mixture, ½ teaspoon of Jamaica flower extract, and ½ teaspoon of pomegranate extract were incorporated for even dispersion of botanical compounds and natural pigmentation. An additional ½ teaspoon of vitamin E oil was added to enhance nourishment and extend shelf life. The final blend was then funneled into roll-on applicators, with optional essential oils for fragrance, resulting in a convenient and fully plant-based cosmetic formulation.

Figure 2: Formulation science of plant-based cosmetic product (images taken by the student researcher)

To evaluate the antimicrobial efficacy and safety of the bio lip oil, bacterial cultures were grown on petri dishes and treated with the lip oil. The plates were incubated at 37°C, and bacterial inhibition zones were observed to determine the lip oil's ability to kill bacteria and confirm its safety for use.

Figure 3: Anti-microbial testing & lip safety evaluation (images taken by the student researchers)