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EUPHORBIA CERIFERA CERA (CANDELILA) EMOLLIENT PROPERTIES, USES AND EFFECTIVENESS IN SKINCARE PRODUCTS

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Abstract

Candelila wax, derived from Euphorbia cerifera cera, is a natural and sustainable component that has a wide range of uses in cosmetic products. This review article explores the chemical composition, extraction techniques, and attributes of Candelila wax, with a focus on its distinctive qualities that make it highly useful in the cosmetic business. Candelila wax has been extensively studied and researched, and these studies have shown that it is highly useful in skincare. It has been found to provide significant benefits in terms of moisturizing the skin, protecting it, and improving the function of the skin barrier. The emollient and moisturizing qualities of this substance enhance skin hydration, while its film-forming capacity creates a protective barrier against environmental stresses. In addition, the non-comedogenic properties and potential anti-inflammatory effects of Candelila wax make it highly suitable for a range of skin types, including those that are sensitive or prone to acne. The future outlook for Candelila wax in cosmetics entails investigating the potential benefits of combining it with other natural substances, creating new and advanced methods of delivering it, and embracing sustainable methods of sourcing and processing. By conducting meticulously planned clinical trials, the effectiveness and safety of the substance may be verified, thereby establishing robust scientific proof for its use in skincare products. By recognizing the possibilities of Candelila wax, we may explore environmentally responsible and skin-conscious cosmetic procedures that align with the changing tastes of mindful customers. By utilizing the potent properties of this natural substance, the cosmetic industry can lead the path towards a more environmentally friendly and enduring future in the field of skincare products.

Keywords: Candelila wax, skincare, cosmetics, natural ingredients

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Introduction

In recent years, the world of skincare has experienced a significant shift in perspective, placing greater emphasis on utilizing natural and sustainable components. There is an increasing awareness among consumers regarding the products they apply on their skin, resulting in a significant rise in the need for skincare formulations that contain plant-derived ingredients (Rocca et al., 2022). Candelila wax, scientifically known as Euphorbia cerifera cera, has gained recognition as a significant natural component with potential attributes for

cosmetic purposes (Sadiku and Rifati-Nixha, 2021). Candelila wax is derived from the Euphorbia cerifera plant, predominantly located in the desert areas of North America, specifically in Mexico and the southwestern United States. The wax is derived from the external layer of the plant and is an intricate blend of several chemical components (Barsch, 2004). The importance of Candelila wax in skincare stems from its distinct chemical composition and physical qualities, which make it a desirable option for inclusion in cosmetics. Candelila wax presents a viable option to synthetic chemicals due to its natural origin, sustainability, and capacity to be used in different cosmetic formulations (Draelos, 2018).

The increasing fascination with botanical elements can be ascribed to the demand for skincare products that are purer and more environmentally friendly (Michalak, 2022). The use of synthetic chemicals and petroleum-based derivatives in certain skincare products may raise concerns over their potential long-term impact on human health and the environment. On the other hand, Candelila wax, which is derived from natural sources, offers a renewable and biodegradable alternative that is in line with the ideals of environmentally friendly and sustainable practices (Goyal and Jerold, 2023). Moreover, Candelila wax possesses certain characteristics that render it appropriate for various skincare uses. It acts as a very efficient emollient, providing the skin with a silky and velvety feel. Furthermore, the film-forming properties of this substance aid in maintaining moisture, resulting in enhanced hydration and increased function of the skin barrier. Candelila wax possesses desirable qualities that make it highly desirable for use in a range of skincare products, including lotions, creams, balms, and lip care items (Draelos, 2018).

Due to the growing need for environmentally-friendly and gentle skincare products, the investigation of Candelila wax in cosmetics shows significant potential. This review article will provide a comprehensive analysis of the chemical composition, extraction techniques, applications, and efficacy of Candelila wax in skincare products. This review seeks to provide a thorough analysis of the current literature in order to highlight the potential of Candelila wax as a natural and sustainable product that has the ability to bring about significant changes in the beauty sector.

Chemical Composition and Properties

Candelila wax, obtained from the Euphorbia cerifera plant, has an intricate chemical composition that gives it unique qualities and functions in skincare applications (Hodge and Sineath, 1956). This section will explore the primary chemical components and physical attributes of Candelila wax, providing insight into its distinctive qualities that make it a desirable ingredient in skincare products.

Table 1: Chemical Composition and Functions of Candelila Wax

Chemical Constituent	Percentage Range	Function in Skincare
Hydrocarbons	40% - 50%	Forms protective barrier, water-repellent properties.
Esters	20% - 30%	Emollient, improves spreadability and texture of skincare products.

Fatty Acids	15% - 25%	Moisturizer, enhances skin hydration, supports skin barrier function.
Others	5% - 15%	May contribute to additional properties and benefits.

1. **Hydrocarbons:** are a prominent constituent of Candelila wax, making up a substantial amount of its chemical composition (Scora et al., 1995). These hydrocarbons consist only of carbon and hydrogen atoms and are characterized by their long-chain structure. The inclusion of hydrocarbons enhances the water-repellent and protective properties of Candelila wax, enabling it to create a barrier on the surface of the skin. This protective layer serves to inhibit the evaporation of fluids and safeguard the skin against external elements, such as inclement weather conditions (Mohiuddin, 2019).

2. Esters: Esters are present in candelilla wax and are produced through the interaction between an alcohol and an organic acid (Tinto et al., 2017). Esters are essential for improving the emollient characteristics of Candelila wax. Emollients are agents that possess the ability to soften and calm the skin, resulting in a sleek and flexible texture. The use of esters found in Candelila wax in skincare products enhances the ability of the formulation to spread and be applied, resulting in a product that is both pleasant and easy to use (Nola et al., 2003).

3. Fatty Acids: Fatty acids are essential constituents of Candelila wax and have a crucial role in its emollient and moisturizing characteristics (Mosquera Narvaez et al., 2022). These fatty acids are crucial for preserving the skin's moisture levels and enhancing a robust skin barrier. Candelila wax forms a protective film on the skin, which helps to decrease water loss, maintain hydration, and prevent dryness (Boelsma et al., 2001).

Physical Properties: Candelila wax possesses various significant physical qualities that contribute to its attractiveness for cosmetics formulations (Winkler-Moser et al., 2019):

Texture and Consistency: Candelila wax possesses a solid yet flexible texture, which facilitates its manipulation and integration into diverse cosmetic formulations. Its elevated melting point enables it to offer stability and serve as a firm foundation for balms and sticks (Kowalczyk and Baraniak, 2014).

Film-Forming Ability: Candelila wax, when applied to the skin, has the capability to create a thin and uninterrupted film. This film improves the adhesion of products and contributes to their longer-lasting benefits. The ability of this product to form a film is particularly advantageous for lip care products, as it aids in retaining moisture and shielding the lips from exterior harmful factors (de Silva et al., 2018).

Non-Comedogenic: Candelila wax is classified as non-comedogenic, indicating that it is improbable to obstruct pores. This characteristic is crucial for skincare products, as it guarantees that the wax does not exacerbate the development of acne or skin imperfections (Draelos, 2011).

Candelila wax's chemical composition, which includes hydrocarbons, esters, and fatty acids, gives it distinct qualities that make it ideal for skincare products. The water-repellent, emollient, and film-forming properties of this substance make it a highly desirable natural

ingredient. Additionally, its non-comedogenic nature enhances its attractiveness as a safe and efficient choice for skincare products. This text will examine the diverse applications and efficacy of Candelila wax in skincare, offering a thorough comprehension of its potential advantages in the cosmetic sector (Bosquez-Molina et al., 2003).

Extraction and Processing

The technique of extracting Candelila wax from the Euphorbia cerifera plant involves a sequence of procedures that necessitate cautious handling in order to maintain the integrity of its advantageous characteristics. This section will examine the techniques employed for extracting Candelila wax and the subsequent processing procedures that influence the quality and purity of the end product (Núñez-García et al., 2022).

Extraction Techniques

Various techniques are used to harvest Candelila wax from the plant, each with its own distinct advantages and considerations.

Solvent Extraction: Solvent extraction is a process that utilizes a non-polar solvent, such as hexane, to dissolve and isolate the wax from the plant material. This approach is frequently favored due to its ability to produce a greater amount of wax and its increased efficiency in extracting Candelila wax from the plant. Nevertheless, the utilization of solvents gives rise to environmental and safety apprehensions, as there is a possibility of leftover solvents persisting in the extracted wax (Attard et al., 2018b).

Mechanical Extraction: Mechanical techniques entail the physical separation of the wax from the plant surface by means of pressing or grinding. This approach is regarded as more ecologically sustainable and yields a higher quality wax due to the absence of any leftover solvents to be concerned about. Nevertheless, the amount of Candelila wax recovered through mechanical extraction may be less than that obtained using solvent extraction (Attard et al., 2018a).

Water-Based Extraction: Water-based extraction methods utilize heated water to extract Candelila wax from the plant. The wax can be retrieved by chilling the mixture, causing the wax to harden and separate from the water. Water-based extraction is widely regarded as a safe and environmentally benign method. However, it may necessitate additional purification operations to further refine the wax (Yeoh et al., 2008).

Effects of Processing Techniques

The post-extraction processing methods have a substantial impact on the quality and purity of Candelila wax (Attard et al., 2016). Several variables can influence the end result:

Impact of Processing Methods: The selection of the extraction procedure might impact the purity of the wax by influencing the presence of impurities and contaminants. Solvent

extraction might potentially result in residual solvents remaining in the extracted wax, which may be undesirable for cosmetic purposes. Conversely, mechanical and water-based extraction procedures typically yield wax that is more pure and contains less contaminants (Seidel, 2005).

Color and Appearance: The color and look of the wax can be influenced by the processing procedures employed. Effective processing is essential for preserving the natural color and texture of wax, which are vital factors to consider in the production of cosmetic products. Excessive processing or exposure to elevated temperatures might cause the wax to change color or undergo modifications in its characteristics (Riederer and Schneider, 1989).

Consistency and Texture: The final consistency and texture of Candelila wax are influenced by the processing methods used. Obtaining a wax with the necessary qualities for certain cosmetic formulations requires precise control over the production conditions (Demirkesen and Mert, 2020).

Applications of Candelila Wax in Skincare Products

Candelila wax is utilized in a variety of cosmetic products due to its distinctive chemical makeup and physical characteristics. Due to its natural origin and wide range of functions, it is a valuable component in many formulations, improving the overall performance and effectiveness of the products. The following are some primary applications of Candelila wax in skincare, as documented by Pan et al. (2021):

1. Natural Emollient: Candelila wax functions as a natural emollient, possessing the capacity to soften and alleviate the skin. Candelila wax, when added to lotions, creams, and balms, creates a barrier on the skin's outer layer, which helps to retain moisture and prevent dehydration. It aids in preserving the skin's moisture levels and maintaining its smoothness and elasticity (Draelos, 2018).

2. Moisturizer: Candelila wax acts as a hydrating agent, providing relief for dry and cracked skin. It functions by establishing a barrier that ensnares moisture in the skin, thus averting dryness and facilitating enduring hydration. Skincare products that contain Candelila wax are especially advantageous for people with dry or sensitive skin since it delivers necessary moisture without obstructing pores (Fadhullah et al., 2020).

3. Thickener: Candelila wax serves as a highly efficient thickening agent in skincare products. It adds thickness and tactile qualities to substances such as creams and lotions, improving their uniformity and providing them with a lavish, indulgent sensation. The potential of this characteristic to enhance the spreadability and application of skincare products ensures uniform coverage on the skin (Iwata and Shimada, 2012).

4. Stabilizer: Candelila wax serves as a stabilizer in skincare formulas, ensuring that the product remains consistent and uniform. It inhibits the segregation of distinct components and guarantees that the product maintains a homogeneous and consistent mixture, resulting in uniform outcomes after application (Sharma et al., 2018).

5. Film-Forming Agent: Candelila wax possesses the notable characteristic of being a film-forming agent, meaning it has the capacity to create a thin, safeguarding layer on the surface of the skin. The ability to form a film is very advantageous in lip care products, including lip balms and lipsticks. Wax serves the purpose of retaining moisture, protecting the

lips from external factors that cause stress, and maintaining their softness and flexibility (Draelos, 2018).

6. Lip Products: Candelila wax is commonly used in lip care products because of its ability to produce a protective layer and its moisturizing characteristics. According to Fadhullah et al. (2020), it aids in the production of hydrated and supple lips while also enhancing the durability of lipsticks and lip balms.

7. Ointments and Salves: Candelila wax is a beneficial ingredient in ointments and salves that are specifically formulated to alleviate minor skin irritations, burns, or insect bites, due to its soothing and protecting properties. The capacity to create a defensive barrier facilitates the process of healing and offers alleviation to the impacted regions (McMahon and Lemieux, 2023).

8. Sunscreen Products: Certain sunscreen formulas may contain Candelila wax. The water-resistant characteristics of the product contribute to its value in improving durability and efficacy, particularly in sunscreens that are based on water (Dianursanti et al., 2020).

Candelila wax serves multiple functions in skincare products, acting as a natural emollient, moisturizer, thickener, stabilizer, and film-forming agent. The cosmetic industry highly values this component due to its extensive range of uses in skincare compositions such as lotions, creams, balms, and lip treatments. Candelila wax's multifaceted characteristics enhance the development of efficient and enjoyable skincare solutions that address many skin types and issues (Shimizu et al., 2022).

Effectiveness of Candelila Wax in Skincare:\

The efficacy of Candelila wax in skincare products has been elucidated through scientific investigations and research. This section provides a thorough summary of the potential advantages that it offers for the skin, including moisturization, shielding, and improvement of the skin's barrier function (Draelos, 2010).

Hydration: Candelila wax's emollient qualities are essential for moisturizing the skin. Studies have demonstrated that skincare products containing Candelila wax can enhance the skin's ability to retain moisture, hence minimizing excessive water loss and addressing dryness. The wax creates a shielding layer on the surface of the skin, which traps moisture and enhances the overall hydration of the skin (Draelos, 2000; Kadu et al., 2015).

Protective: Candelila wax's capacity to form a film provides a safeguard for the skin, acting as a barrier against harmful external factors. It provides protection for the skin against severe weather conditions, such as wind and cold, which can otherwise result in dry and cracked skin. The presence of the protective film on the skin helps to minimize the negative effects of environmental contaminants, hence promoting a healthier and more resistant complexion (McIntosh et al., 2018).

Improving Skin Barrier Function: The skin barrier plays a vital role in preserving the health of the skin. Research has shown that Candelila wax can enhance the integrity of the skin barrier by forming a protective layer. This occlusion serves to reduce transepidermal water loss (TEWL) and shield the skin from environmental irritants. Candelila wax enhances the integrity of the skin barrier, hence helping to maintain the skin's innate moisture equilibrium and facilitating a more uniform and refined skin texture (Kowalczyk and Baraniak, 2014).

Anti-inflammatory Properties: Candelila wax has been found to have anti-inflammatory qualities, which can help to calm and alleviate skin irritation and inflammation. This characteristic renders it appropriate for utilization in items designed for sensitive or reactive skin kinds, as it has the capacity to diminish redness and alleviate pain (Kowalczyk and Biendl, 2016).

Non-Comedogenic Nature: Candelila wax has been determined to be non-comedogenic, indicating that it is unlikely to cause pore blockage. This characteristic renders it a fitting component for skincare solutions, even for persons with a propensity for acne or excessive oiliness (Draelos, 2011).

Skin-Friendly Profile: Empirical research has shown that Candelila wax typically displays a favorable safety profile and is highly compatible with the skin. According to Chuberre et al. (2019), it is regarded as a low-risk component in terms of causing allergic reactions or skin sensitization.

Various scientific studies provide evidence for the efficacy of Candelila wax in skin care products. The potential advantages of this product include moisturizing the skin, shielding it from environmental factors, improving the skin's protective barrier, and having a composition that is gentle on the skin. Candelila wax possesses qualities that render it a highly important natural component in many skincare formulas, suitable for addressing a broad spectrum of skin types and issues. The incorporation of Candelila wax in cosmetic products enhances their overall effectiveness and supports the increasing need for skincare solutions that are both natural and sustainable (Juncan et al., 2019; Rähse, 2020).

Conclusion

To summarize, Candelila wax (Euphorbia cerifera cera) is a highly adaptable and promising natural component that has a wide range of uses in healthcare products. This review article has utilized a thorough examination of scientific studies and research to emphasize the efficacy of Candelila wax in enhancing the health and vibrancy of the skin. The distinctive chemical makeup of Candelila wax, which contains hydrocarbons, esters, and fatty acids, is responsible for its emollient, moisturizing, and film-forming characteristics. Candelila wax functions as a natural emollient and moisturizer, offering hydration and calming advantages to the skin. The capacity of this substance to form a film serves to produce a protective barrier, which in turn safeguards the skin from external stressors and improves its barrier function.

In addition, Candelila wax is used as a stabilizer and thickening ingredient to improve the texture and spreadability of skincare products. The non-comedogenic nature and potential anti-inflammatory qualities of this substance make it very suitable for all skin types, particularly sensitive and acne-prone skin. Through the utilization of Candelila wax and the advancement of research and innovation, the cosmetic industry has the ability to provide skincare formulations that are tailored to individual needs, highly efficient, and environmentally conscious. By embracing the use of Candelila wax, cosmetic techniques can become more environmentally responsible and better suited for the needs of consumers who prioritize natural ingredients.

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