

Review Article on Anti-Inflammatory Properties of Shea Butter on Skin

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Abstract:

In contemporary society, skincare products are celebrated for their diverse cosmetic and therapeutic attributes. Natural substances such as turmeric, neem, aloe, rosemary, olive oil, and coconut oil have long been employed to address various skincare issues. In recent years, Shea, which is derived from the native plant of Africa, has emerged prominently within the cosmetic industry, revealing notable moisturizing and healing properties. While Shea Butter has been traditionally utilized in native countries, its integration into cosmetic formulations has gained momentum with the surge in scientific research and the demand for innovative skincare solutions. This article delves into the multifaceted properties of Shea Butter, elucidating its mechanisms. Among its distinguished attributes are its sun-screening effect, anti-inflammatory and healing properties, anti-aging potential, and its role as an emollient and moisturizer. As the demand for effective and natural skincare solutions continues to rise, the exploration of Shea Butter's comprehensive benefits contributes to its standing as a pivotal cosmetic core ingredient in contemporary formulations. The Article aims to enlighten the anti-inflammatory properties of Shea Butter with extraction techniques.

Keywords: Shea Butter, Biological Sources, Pharmacological Properties, Methods of Extraction, Evaluation test, In-Vitro Assay, Manuscript

Introduction:

Shea Butter, derived from the fruits of the *Vitellaria paradoxa* plant indigenous to the Sub-Saharan African Eastern Region, holds cultural, economic, and medicinal significance. Known as karité in French, its cultivation not only supports the livelihoods of numerous women in the region but also plays a pivotal role in their communities.¹ extraction process involves harvesting Shea fruits from the forest, employing traditional methods to extract the pulp, and subsequently selling the resulting butter in local markets. Beyond its economic importance, Shea Butter serves various purposes, functioning both as a dietary substance and a medical agent.² The sweet-textured pulp of the Shea fruits is a local delicacy, while the kernels, known as Shea Nuts or Seeds, undergo processing to produce the Shea Butter.² This versatile substance finds application not only in traditional culinary practices but also in medicinal contexts, showcasing its multifaceted utility. Furthermore, consumers have the option to choose between Shea Butter and Shea Oil based on their individual preferences, highlighting the adaptability of this natural resource in meeting diverse needs.^{3,4}

Shea Butter serves as a cost-effective alternative to confectionery products, presenting a more economical option compared to Cacao Butter without compromising taste or quality.⁵ Beyond its application in confectionery, Shea Butter finds utility in diverse industries such as food processing, cooking, cosmetics, and pharmaceuticals, emerging as a natural moisturizer with therapeutic properties. Derived from brown Shea Nuts containing an odorless and white substance, Shea Butter boasts a composition rich in Vitamin A and E, complemented by fatty acids including palmitic, stearic, oleic, linoleic, and arachidic acids.^{6,8} This unique composition positions Shea Butter as a sought-after ingredient, particularly due to its recognized anti-inflammatory properties, leading to a growing demand in various sectors. The subsequent sections deliver a detailed exploration of Shea Butter's multifaceted properties, emphasizing its significance across different industries and elucidating the mechanisms underlying its anti-inflammatory effects.^{5,7}

Natural Occurrence and Chemical Properties Of Shea Butter

V. Paradoxa (*Vitellaria Paradoxa*) is the scientific name of the Shea, which belongs to the Sapotaceae family.⁹ This family is divided furthermore into 53 genera, in the subtropical and tropical regions. *V. Paradoxa* is found in different regions of African Countries the limitation of the plant worldwide is the climatic region of the species.^{10,11} As the Shea plant can be grown at an altitude of 100–600 m and annual temperatures of between 25–29 °C, yearly rainfall of 600–1400mm per year is required with a dry season of approx 5-7 months. The soil condition for trees for growth needs iron-rich soil with humus. The tree's roots don't tolerate much water content they require optimum moisture in the soil.¹³

The native countries in which we can easily find or grow the Shea Tree are Gambia, Senegal, Guinea, Côte d'Ivoire, Mali, Burkina Faso, Niger, Ghana, Benin, Togo, Nigeria, Cameroon, Chad, Central African Republic, South Sudan, Uganda Democratic Republic of the Congo, and Ethiopia.^{12,13}

The fruit of the *V. Paradoxa* were cultivated from May to July every year. As the *V. Paradoxa* is a deciduous plant that falls off its leaves in the cold climate for energy storage and survival.¹⁴ The fruit of the plant is Green when unripened and turns yellowish to brown after fully ripening. The native worker collects the ripened fruit from the ground and de-pulp them. For the Shea Butter, we required the kernels of the Shea Seed which is surrounded by a thin layer. The nut is covered with two hard layers that store the lipids and other content in the inner corner of the shell.^{15,16}

The normal size of the Shea Nut is from 32.80 ± 2.91 to 44.29 ± 5.09 mm. About 70-77% of seeds range from 40-45mm in diameter.¹⁷ The major chemical Constituents of Shea Butter that make it unique for different industries worldwide also have different properties. As we check out the moisture content of the Dried Kernels is up to 5-6% or butter 1-2%. Triglyceride components can affect the physicochemical properties of the active unsaponified component which is used for cosmetic formulations.^{18,19} There is a mixture of the unsaturated components of different polyisoprene present in various ratios, which is identified in terms of the acid values and free fatty acids of the components.²⁰

In shea butter are total number of 16 unsaturated and saturated fatty acids are present. 5 Fatty acids have a higher level of composition than other fatty acids, oleic, stearic, palmitic, linoleic, and arachidic.^{21,22} Oleic acid has the highest level of 32-60% which is followed by Stearic Acid with 28-55%. The value of Palmitic Acid is 3.2 to 7.5%, Linoleic Acid is 4% to 8% and Arachidic Acid value is 0.8 to 2%.^{23,24,25}

Phytochemical components that are responsible for the anti-inflammatory properties are present in the form of Triterpenoids. α - Amyrin and β - Amyrin triterpenoids have anti-inflammatory properties.²⁶ By Activating β - Cells (NF- κ B) it shows anti-inflammatory and anti-cancer properties. Different constituents like triterpene acid, triterpene glycoside, steroid glycosides, and other phenolic compounds, as active constituents, if they are used individually they act as antioxidants and anti-inflammatory agents.^{27,28}

Pharmacological Properties of Shea Butter

As we know the butter of Sheas is extracted through the kernels and Shea Nuts, After the isolation of the Nuts, many Pharmacological studies in in-vivo and in vitro were conducted to check the bioactive ingredients and properties.

The studies reported that active compounds that were isolated from the different parts of the *V. Paradoxa* have different properties like anti-oxidant, anti-inflammatory, anti-cancer, anti-viral, anti-fungal, wound healing, insecticidal, and anti-diabetic.²⁹ These properties have a therapeutic effect when used in a proper formulation. There is less formulation of these properties that can be seen in the market. The use of the Shea is more at the regional level to treat some of the basic diseases by their traditional methods.³⁰

Despite these active ingredients, there are some common properties by which it is a good carrier ingredient in the cosmetic industry as it has a skin smoothing property that acts as a moisturizer and an emollient. The key role of Shea Butter is to nourish the skin and prevent dryness.³¹ In the cosmetic industry, it is used as an emollient which provides a base or good carrier for the formulations. The Antioxidant properties make it a good preservative that increases the shelf life of the formulation. Rich in Vitamins A and E it also had some sun-protecting properties at a mild level.³²

Methods of Extraction of Shea Butter

Shea Butter is extracted from Shea Fruits that are green to yellow. To extract the butter from the fruit several steps have to be followed systematically to get the butter.³³ First step we have to collect the ripened fruit from the trees, the native workers who joined in this process collected the fruits that had fallen on the ground and after that, they washed them properly and removed the pulp of the fruit for the kernels. this process is called the De-Pulping either it can be done by the fermentation or manual peeling of the mesocarp and endocarp of the fruit.^{34,35} After that, the peeled fruits are immersed in boiling water for 30-35 min. at 100-105°C just to stop the biological and enzymatic activities of the nuts.³⁶ Then the boiled Shea Nuts are placed in the sunlight for 5-10 days for drying. They can be dried using oven for 2-3 days. The sunlight-dried method is traditional and practiced more than any other method. Different dryers can be used to completely dry out the nuts. After the complete drying process, some moisture content remains in the nuts. After all these processes nuts are De-Shielded or De-Husk to remove other layers of the nuts. Once we get the de-shielded nuts the extraction process followed to obtain the Shea Butter is mentioned below.^{37,38}

Traditional Method of Extraction^{37,39}

In the native countries, more than 50% of Shea Butter is extracted from traditional methods by women. The first after the outer shell was removed started with the size reduction method then they kneaded the nuts to get butter. In kneading, we get a lightweight white mixture which if further boiled evaporates the water content and emulsified substances from the Shea Oil.

The liquid is then placed to cool down for 10-20 hours and it solidifies into the final product as Shea Butter.

Mechanical Method of Extraction⁴⁰

In the mechanical method of extraction, the dried kernels are heated at 15-20°C in the heating chamber and then directly poured into the crusher for size reduction, an optimum unit force is applied according to the sample size, by the pressure of the oil secretes out through the gaps and collected in a vessel. There is some oil content remaining in the pressed cakes on the nuts the process is again repeated to the shea nut cakes to remove all the fat content through it. The fat content is not completely removed from the mechanical process more than 15-20% of the oil remains in the nuts. There is a problematic situation that arose from this method as it saves the wood fuel but the workers who are extracting the shea butter are financially not able to afford the cold pressing units.

Centrifugation Method of Extraction^{41,42}

The Centrifugation method is also the mechanical method that uses the Centrifuge Machine for butter extraction, with a higher efficiency than the cold pressing method. The mean efficiency of the centrifugation method is equivalent to the traditional or Screw pressing methods. In this method, a drum with an optimum capacity is loaded with a frequency of 1000 rpm. The emulsion is prepared before the process. The light-weighted oil was separated and stored in the drum, the process continued until the clear oil was obtained.

Use of Shea Butter As Excipient

Excipients are those carriers that are non-active and increase the release rate of the active ingredients or give a synergistic effect with the active components. If we use the unsaturated butter in the formulation then first to check the compatibility of the Shea Butter it should have a great spreadability, release rate, and other factors.

As unsaturated Shea Butter is thick, we used to treat it for the optimum spreading. For the Long-term stability of the Shea Buuter used ointments or formulation we need to study certain parameters for the moister content, insoluble impurities, free fatty acid, and peroxides values among all of these oxidation reactions that can lead to rancidity of the Free fatty acid in the formulations.

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