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Review Article

Stratum Corneum

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The Potential of Ayurvedic herbs in maintaining Stratum Corneum pH: A Critical Review

Verma K[1*], Chauhan M[2], Sharma R[3]

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[1*] Kamini Verma, Second Year Post Graduate Scholar, Department of Ayurveda Samhita and Siddhanta, Rajiv Gandhi Government Post Graduate Ayurvedic College and Hospital, Paprola, Himachal Pradesh, India.

[2] Manisha Chauhan, Second Year Post Graduate Scholar, Department of Ayurveda Samhita and Siddhanta, Rajiv Gandhi Government Post Graduate Ayurvedic College and Hospital, Paprola, Himachal Pradesh, India.

[3] Ravi Sharma, Final Year Post Graduate Scholar, Department of Ayurveda Samhita and Siddhanta, Rajiv Gandhi Government Post Graduate Ayurvedic College and Hospital, Paprola, Himachal Pradesh, India.

Ayurveda, the ancient Indian medicinal system, offers a holistic approach to skincare by integrating body, mind, and spirit. This study explores the Ayurvedic perspective on skin health, focusing on the concept of "Twak," which refers to the seven layers of skin, and their role in maintaining skin barrier integrity. Ayurvedic principles such as Varnya (skin brightening) and Shothahara (anti-inflammatory) highlight the therapeutic potential of herbs and natural remedies for skin care. The pH balance of the stratum corneum (SC) is crucial for skin barrier function and hydration, with disruptions linked to various dermatological conditions. This study reviews the pH levels and skin benefits of selected Ayurvedic drugs, including Aloe vera, Papaya, Turmeric, Amla, Neem, Ginkgo biloba, Licorice, and Tulsi. These substances demonstrate potential in maintaining SC pH, supporting the skin's acid mantle, and preventing pathogenic colonization. Aloe vera gel maintains a pH range of 4.5 to 5.5, promoting skin health, while neem products exhibit a pH range of 4.67 to 5.01, aligning with the skin's natural acidic environment. Papaya's pH (4.2 to 5.65) supports the skin's acid mantle and enzyme activity. Turmeric remains stable in acidic environments (pH 1-7), offering anti-inflammatory and antioxidant benefits. Amla's slightly acidic pH enhances skin barrier function and hydration. Ginkgo biloba extracts (pH 5.5 to 6.5) improve skin texture and rejuvenation. Licorice root extract (pH 4.55 to 4.63) exhibits anti-inflammatory, skin whitening, and antioxidant properties. Tulsi-based products maintain a pH compatible with human skin, providing antimicrobial and anti-inflammatory benefits. The study concludes that integrating Ayurvedic practices with contemporary dermatological insights may offer effective, holistic solutions for maintaining skin health and barrier function.

Keywords: Ayurvedic Drugs, Dermatology, Holistic Health, pH, Stratum Corneum

Corresponding Author

Kamini Verma, Second Year Post Graduate Scholar, Department of Ayurveda Samhita and Siddhanta, Rajiv Gandhi Government Post Graduate Ayurvedic College and Hospital, Paprola, Himachal Pradesh, India.

Email: kaminiverma89888@gmail.com

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Introduction

Ayurveda, an ancient Indian medicinal system, offers a holistic approach to skin care by emphasizing the balance of body, mind, and spirit. It provides a unique perspective on skin health through the concept of "*Twak*" or skin layers, which are integral to maintaining skin health and beauty. Ayurvedic principles for skin care are based on several key concepts, including *Vayasthapana* (age-defying), *Varnya* (skin brightening), *Sandhaniya* (cell regeneration), *Vranaropana* (healing), *Twachya* (nurturing), *Shothahara* (anti-inflammatory), *Twachagnivardhani* (strengthening skin metabolism), and *Twagrasayana* (retarding aging). **[1]** Ayurveda's skin care approach integrates internal and external factors. It considers the influence of diet, lifestyle, and environmental factors on skin health, aligning with the modern understanding of holistic skin care.**[2]** Moreover, Ayurveda utilizes a wide range of natural ingredients, including herbs, spices, and special preparations known as *Rasayana*, for skin treatments.**[3]**

The rationale for studying the concept of pH in Ayurveda with the help of some specific Ayurvedic drugs stems from its significant impact on skin health and its involvement in various dermatological conditions. Elevated SC pH has been linked to atopic dermatitis (AD), neonatal skin issues, aged skin problems, and inflamed skin.**[4]** Understanding the factors influencing skin pH, both intrinsic (genetics, age, gender) and extrinsic (skin care products, climate), is essential for developing effective therapeutic strategies.**[5,6]**

The objective of this research is to explore the potential of maintaining SC pH and barrier integrity as a preventive and therapeutic approach for skin conditions with the help of selected Ayurvedic drugs. This includes the study of a brief introduction to skin in Ayurveda and Modern medicine. Additionally, the study aims to determine the pH and skin benefits of selected Ayurvedic drugs like Aloe vera, Papaya, Turmeric, Amla, Ginkgo biloba, Licorice, and Tulsi.

Ayurvedic Layers of Skin

According to Ayurvedic texts, there are seven layers of skin, each with its own specific functions and characteristics. Seven layer of skin in Ayurveda are:

1. Avabhasini (outermost layer) 2. *Lohita* 3. *Shweta* 4. *Tamra* 5. *Vedini* 6. *Rohini* 7. *Mamsadhara* (innermost layer). These layers are thought to correspond to different aspects of skin health and function, including protection, nourishment, and sensory. Modern dermatology recognizes three main layers of skin: epidermis, dermis, and hypodermis. While the number of layers differs between Ayurveda and modern science, both systems acknowledge the complexity and importance of skin structure in maintaining overall health.

The stratum corneum is the outermost layer of the skin, playing a vital role in the skin barrier function. It consists of dead keratinocytes called corneocytes, lipids, and desmosomes. The stratum corneum has a complex structure with three distinct pH zones that contribute to its protective functions.**[7]**

It prevents water loss from the body and protects against penetration by exogenous substances. **[8]** Stratum corneum (SC) acidity plays a crucial role in maintaining healthy skin barrier function.**[9]**

The acidic pH of the SC supports beneficial microorganisms, enzyme activity for ceramide production, and overall skin hydration. The skin barrier relies on SC lipids, natural moisturizing factors (NMFs), and an acidic pH, with disruptions in these components potentially leading to various skin conditions.**[10,11,12]**

In Ayurveda, the skin, referred to as "*Twak*," is considered an *Updhatu* (secondary tissue) of *Mamsa Dhatu* (muscle tissue). It acts as a protective barrier against environmental factors and is integral to sensory perception, thermoregulation, and immune defense. The formation of *Twak* is linked to the layering of cream on boiling milk, indicating a natural, gradual development process. Each layer has distinct thickness and functions, which are crucial for protection andsensation.**[13]**

Role of Ayurveda in Skin Care[13-20]

- Ayurveda emphasizes that healthy skin is a reflection of overall health. It integrates mental and spiritual well-being with physical health, suggesting that internal balance is key to skin health.
- Skin care regimens are tailored according to an individual's *Prakriti* (body constitution), which dictates the specific needs and treatments for maintaining healthyskin.

- Ayurvedic skin care incorporates natural ingredients that are believed to support the skin's natural pH balance, promoting a healthy stratum corneum.
- Ayurvedic skin care involves the use of over 200 herbs, minerals, and natural substances. These are used in various formulations like *Lepa* (herbal pastes) for external application, which are known for their safety and efficacy in treating skindisorders.
- Ayurvedic skin care drugs emphasize holistic approaches to skin health, integrating internal and external treatments. This ancient system utilizes various herbal formulations and practices, such as *Lepa* (external applications) and internal remedies like *Vayasthapan Mahakashaya*, to address a wide range of dermatological issues. The efficacy of these treatments is supported by their safety, affordability, and alignment with natural health principles.
- Traditional practices such as *Abhyanga* (oil massage) and *Lepa* (medicinal pastes) utilize herbs that may help maintain or restore optimal skin pH levels. Common herbs include Neem, Turmeric, and Liquorice, known for their therapeutic properties.
- ***Panchakarma*:** This detoxification process is integral to Ayurvedic cosmetology, promoting skin rejuvenation.
- ***Rasayana* Therapy:** Aimed at delaying aging and enhancing beauty, this therapy is crucial for maintaining skin vitality.
- Ayurveda considers skin health as a reflection of overall well-being, influenced by factors like *Prakrit Dosha* and *Agni*.
- The stratum corneum's pH is crucial for barrier integrity and antimicrobial defence; lower pH levels are associated with improved skin function.
- Ayurvedic formulations often include acidic components that can help acidify the skin, potentially enhancing its barrier properties.
- Recent studies indicate that products with a lower pH can improve skin barrier function and cohesion, suggesting that Ayurvedic products may have beneficial effects in this regard.
- The integration of Ayurvedic practices with contemporary dermatological insights could lead to more effective skin care solutions that respect the skin's natural pH.

Aloe vera[21-25]

The pH of Aloe vera and its various formulations is crucial for its effectiveness in both medicinal and cosmetic applications. Generally, Aloe vera gel has a pH range of approximately 4.5 to 5.5, which is slightly acidic and beneficial for skin health. This pH level helps maintain the skin's natural barrier and supports its healing properties. The pH of formulated products, such as creams combining Aloe vera with other ingredients, typically ranges from 6.0 to 6.6, ensuring compatibility with skin conditions and enhancing moisturizing effects.

Aloe vera contains saponins, flavonoids, and polysaccharides, contributing to its therapeutic properties. Vitamin E and other compounds in Aloe vera enhance skin hydration and smoothness. The pH can vary based on processing methods and additional ingredients, affecting the overall efficacy of Aloe vera products.

Neem[26-27]

The pH of neem products for skin applications typically ranges from 4.67 to 5.01, which aligns with the skin's natural acidic environment. This pH range is crucial for maintaining the skin's barrier function and overall health. Neem, known for its diverse therapeutic properties, is often formulated into gels and emulgels that are optimized for skin.

Neem exhibits significant antibacterial and antifungal properties, making it effective against skin infections and conditions like acne. The anti-inflammatory compounds in neem help reduce redness and irritation, beneficial for conditions such as dermatitis. Novel formulations improve the penetration of neem's active compounds, enhancing therapeutic outcomes.

While neem's benefits are well-documented, some individuals may experience sensitivity or allergic reactions, highlighting the need for personalized skincare approaches.

Papaya[28]

The pH of papaya, which ranges from 4.2 to 5.65, plays a significant role in its application for skin care.

This acidic nature aligns well with the physiological pH of human skin, which is typically between 4.1 and 5.8, making papaya beneficial for maintaining skin health and integrity, which is crucial for regulating the microbiome and preventing pathogenic colonization.

The enzymes present in papaya, such as papain, thrive in this pH range, promoting skin exfoliation and renewal. The acidic pH can help reduce inflammation and support the healing of skin conditions like acne and rosacea.

Green papaya lotions and face masks leverage the fruit's pH and enzymatic properties to enhance skin texture and clarity. Combining papaya with other natural ingredients, such as lemon and honey, can further enhance its skin benefits while maintaining an optimal pH.

Turmeric[29-30]

The pH of turmeric, particularly its active component curcumin, plays a significant role in its application for skin health. Research indicates that turmeric exhibits a yellow colour at acidic pH levels (1-7) and transitions to orange and red hues as the pH increases, which can be utilized in cosmetic formulations and pH indicator applications.

Curcumin's anti-inflammatory effects can help treat various skin conditions, including acne and psoriasis. The antioxidant properties of turmeric can combat oxidative stress, contributing to anti-aging benefits.

Amla[31-35]

The pH of *Amla* (*Phyllanthus emblica* L.) is an important factor in its application for skin health. Amla is known for its rich antioxidant properties, particularly due to its high vitamin C content, which can influence skin pH and overall skin health. Amla typically has a slightly acidic pH, which aligns with the skin's natural acid mantle, crucial for maintaining skin barrier integrity. The application of *Amla* extract can help normalize skin pH, enhancing the skin barrier function and promoting hydration. *Amla's* antioxidant properties protect skin keratinocytes from UVB-induced inflammation and apoptosis, suggesting its role in maintaining skin health under oxidative stress. *Amla* is utilized in various skin care formulations due to its ability to improve skin conditions, including its anti-aging effects and its role in treating skin afflictions.

Regular use of *Amla* can enhance skin resilience and combat chronic inflammatory conditions, further supporting its therapeutic potential.

Ginkgo biloba

The pH of Ginkgo biloba extracts used for skin applications is generally formulated to be compatible with human skin, typically around 5.5 to 6.5. This pH range is crucial for maintaining skin health and ensuring the effectiveness of the active compounds in Ginkgo biloba, which include antioxidants and anti-inflammatory agents. Ginkgo biloba extracts are utilized in formulations aimed at skin whitening and reducing pigmentation caused by UV exposure.**[36]** Ginkgo biloba's antioxidant properties help in scavenging free radicals, contributing to skin protection and rejuvenation. A cream containing Ginkgo biloba extract demonstrated significant anti-wrinkle effects and improved skin texture during a clinical trial.**[37]** The extract has been shown to enhance skin blood flow, which can improve overall skin health and rejuvenation.**[38]**

Licorice[39-41]

The pH of licorice, particularly in its application for skin care, is generally weakly acidic, which is beneficial for maintaining skin health. Research indicates that licorice root extract, specifically from Glycyrrhiza glabra, has a pH range of approximately 4.55 to 4.63 when formulated into creams. Licorice contains glycyrrhizin, which exhibits anti-inflammatory effects, making it useful for conditions like eczema and psoriasis. The extract inhibits tyrosinase, an enzyme involved in melanin production, thus aiding in skin whitening. Licorice has demonstrated significant antioxidant properties, which help protect the skin from oxidative stress and UV damage. Heat-treated licorice extracts show enhanced bioactivity, increasing their effectiveness in cosmetic applications.

Although licorice provides many advantages for the skin, overuse may cause negative effects, including hypokalemia and hypertension, attributed to its mineralocorticoid-like properties. Therefore, using it in moderation.

Tulsi[42-43]

The pH of Tulsi (*Ocimum tenuiflorum*) products, particularly in formulations like soaps and creams, is crucial for skin health.

Studies indicate that herbal formulations containing Tulsi maintain a pH that is generally compatible with human skin, which typically ranges from 4.5 to 5.5. This compatibility is essential for preventing skin irritation and maintaining the skin's natural barrier. The herbal soap containing *Tulsi* was evaluated for pH and demonstrated favourable characteristics, aligning with skin compatibility standards. The soap's formulation included other natural ingredients, enhancing its therapeutic properties while ensuring a balanced pH. Tulsi is recognized for its antimicrobial and anti-inflammatory properties, which can be beneficial for skin conditions. The presence of phytochemicals in Tulsi contributes to its effectiveness in skin care formulations, further supporting its use in maintaining skin health.

Ayurvedic products appear beneficial for maintaining the pH of the stratum corneum, but individual skin reactions may differ. More research is needed to measure these effects and create standardized formulations that enhance skin health. Although Ayurvedic treatments present various advantages, some contend that modern dermatological methods yield faster outcomes using advanced technologies and formulations. Nonetheless, the increasing inclination towards natural remedies underscores Ayurveda's continued importance in today's skincare landscape.

Discussion

This review article investigates Ayurvedic principles applied to skincare, emphasizing the holistic integration of body, mind, and spirit. It explores the seven layers of skin ("*Twak*") and their importance in maintaining the skin barrier's integrity. Ayurvedic concepts like *Varnya* (skin brightening) and *Shothahara* (anti-inflammatory) highlight the benefits of natural herbs and remedies. The research reviews the pH levels and skin benefits of Ayurvedic ingredients such as Aloe vera, Papaya, Turmeric, Amla, Neem, Ginkgo biloba, Licorice, and Tulsi, which support skin health by maintaining the stratum corneum's pH balance. The study concludes that combining Ayurvedic practices with modern dermatological insights can offer effective, holistic skincare solutions.

This research is significant because it bridges the gap between traditional Ayurvedic skincare practices and contemporary dermatological science, offering holistic skin health solutions.

By examining Ayurvedic concepts like "*Twak*" and the therapeutic potential of various herbs, the study highlights the importance of maintaining skin pH balance for barrier integrity and hydration.

Conclusion

This integration of Ayurvedic wisdom with modern science could lead to the development of natural, effective skincare treatments, promoting overall skin health and addressing dermatological issues through non-invasive, natural means. It highlights Ayurveda's potential in promoting skin health and preventing skin disorders.

Key Takeaways

1. Ayurvedic Principles: The study emphasizes the holistic approach of Ayurveda, focusing on the seven skin layers (*Twak*) and principles like *Varnya* (skin brightening) and *Shothahara* (anti-inflammatory) to maintain skin health.

2. pH Balance: Proper pH balance of the stratum corneum is crucial for skin barrier function and hydration, with Ayurvedic herbs like Aloe vera, Neem, and Turmeric playing a significant role in maintaining this balance.

3. Natural Skin Care: The research highlights the therapeutic potential of Ayurvedic herbs and natural remedies, showcasing their effectiveness in promoting skin health, supporting the skin's acid mantle, and preventing pathogenic colonization.

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