

IN-DEPTH REVIEW

Olive Oil in Dermatology: Bridging Ancient Traditions with Modern Medicine

Zaryab Alam, BS¹, Aasim Jaffri, BS², Rahib K Islam, BS³, M Zaid Shami, MD⁴, Hamza Malick, BS¹, Aamir N. Hussain, MD, MAPP⁵

¹ Department of Medicine, Texas A&M University Health Science Center, Bryan, TX, USA

² Department of Medicine, Albany Medical College, Albany, NY, USA

³ Department of Medicine, Louisiana State University Health New Orleans School of Medicine, New Orleans, LA, USA

⁴ Department of Medicine, HCA Florida Aventura Hospital and Medical Center, Aventura, FL, USA

⁵ Department of Plastic Surgery and Dermatology, Galaria Plastic Surgery and Dermatology, LLC, Virginia, USA

ABSTRACT

Background: Olives, a cornerstone of Mediterranean culture, hold deep historical, spiritual, and cultural significance, especially in Islamic traditions. Their use in complementary and alternative medicine has gained attention, particularly in dermatological treatments due to their purported health benefits. The review focuses on the application of olives and their derivatives, such as olive oil, in skin-related conditions.

Methods: A systematic literature review was conducted using EMBASE and PubMed databases, following PRISMA guidelines. A total of 44 articles were selected for inclusion, examining the effects of olive-based products on various dermatological conditions.

Results: Olive oil was found to be effective in reducing erythema, scaling, and pain in patients suffering from radiation and contact dermatitis. It also showed promise in managing atopic dermatitis and psoriasis by modulating inflammatory pathways. Additionally, olive oil facilitated wound healing, benefiting patients with pressure ulcers, chronic wounds, and burns. The Mediterranean diet, rich in olives, was associated with reduced inflammation in conditions such as cystic acne and hidradenitis suppurativa. These effects are attributed to the antioxidant and anti-inflammatory properties of phenolic compounds found in olives.

Conclusion: This review underscores the potential of olives in dermatological applications, highlighting their natural, affordable, and therapeutic benefits. Olive oil and the Mediterranean diet could offer promising, complementary treatments for a range of skin conditions. Further research is warranted to explore the full therapeutic potential of olives in clinical practice.

INTRODUCTION

The olive tree (*Olea europaea*), emblematic of the Mediterranean, has been revered for its contributions to diet, medicine, and cultural rituals for thousands of years,

intertwined with the region's ecology and cultural fabric.¹

The tree's fruit, olive oil, is not only a staple in the Mediterranean diet but also a symbol of peace, wisdom, and prosperity across

various civilizations, including Greco-Roman, Jewish, Christian, and Islamic cultures.²

In Islamic traditions, the olive is celebrated for its health benefits and spiritual significance, frequently mentioned in the Quran.³ This reverence is reflected in its extensive use in traditional remedies, emphasizing its importance in herbal medicine. Modern dermatology has begun to rediscover and validate the multifaceted benefits of olive oil and its derivatives, exploring their potential in treating a wide array of skin conditions.⁴ This review delves into the enduring legacy of olives, bridging the gap between their traditional uses and the scientific scrutiny of contemporary medicine, with a particular focus on their applications in dermatological treatments and the mechanisms underlying their therapeutic properties.

The primary objective of this review is to systematically evaluate the evidence for the use of olive oil and its derivatives in dermatological care, focusing on their therapeutic efficacy and underlying mechanisms. Secondary objectives include understanding the historical and cultural significance of olives in medicine and exploring the potential for integrating olive-based products into modern dermatological treatments.

METHODS

A comprehensive literature search was conducted using the EMBASE and PubMed databases from their inception until March 2023. The search was structured following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Predefined selection criteria were established to ensure the inclusion of relevant studies. Studies were included if they were randomized controlled trials,

clinical trials, observational studies, or systematic reviews focusing on the dermatological use of olive oil and its derivatives. The eligible population included patients with dermatological conditions such as atopic dermatitis, psoriasis, radiation dermatitis, contact dermatitis, cystic acne, hidradenitis suppurativa, pressure ulcers, chronic wounds, and burns. The primary outcomes assessed were erythema, scaling, pain, inflammation, wound healing, and skin barrier function.

The review also examined studies exploring the role of olives or olive oil as part of the Mediterranean diet in dermatological outcomes. Only articles published in English were included. Exclusion criteria eliminated animal and in vitro studies, case reports, editorials, and studies that did not focus on dermatological outcomes.

Two independent reviewers screened titles and abstracts to identify potentially relevant studies, followed by full-text reviews to ensure eligibility according to the inclusion criteria. Disagreements between the reviewers were resolved through discussion or consultation with a third reviewer. The search strategy used combinations of key terms such as "olive oil," "olive derivatives," "Olea europaea," "Mediterranean diet," "dermatology," "skin conditions," "psoriasis," "atopic dermatitis," "contact dermatitis," "wound healing," "inflammation," and "antioxidant."

A total of 44 articles were selected for the initial review process. However, after further assessment, 20 articles were referenced in the final analysis. Studies that were excluded either lacked relevance to the primary dermatological outcomes, were redundant, or focused on in vitro or animal models without providing human data. Data from the included articles were extracted

systematically, focusing on the type of study, patient demographics, clinical outcomes, and

specific findings related to olive-based dermatological treatments.

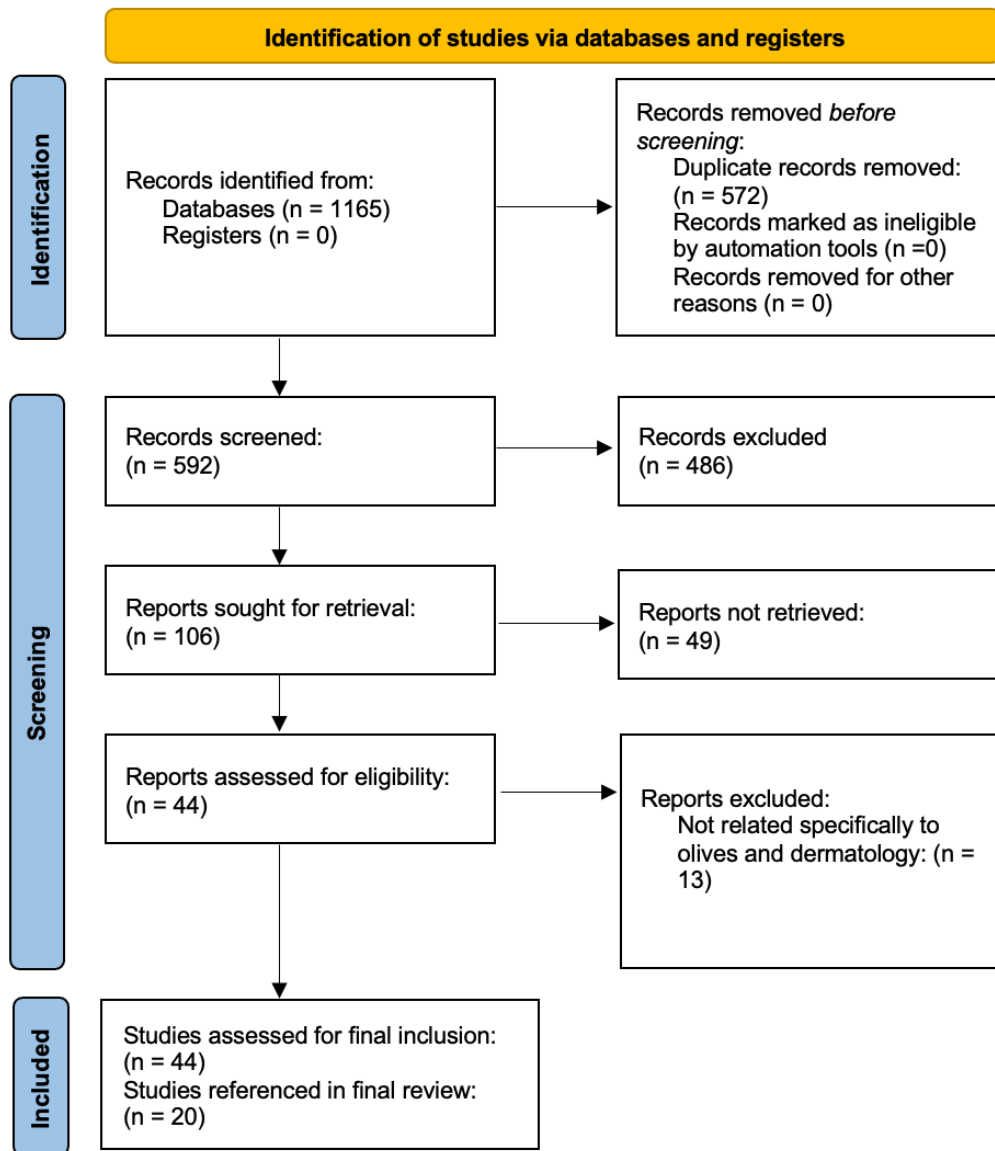


Figure 1. Flowchart of the identification of eligible studies.

RESULTS

The analysis shows olive oil effectively alleviates symptoms in various dermatological conditions. Specifically, it reduced erythema, scaling, and pain in patients with radiation-induced and contact dermatitis.⁵ Studies also highlighted olive oil's success in mitigating atopic dermatitis

and psoriasis symptoms by influencing the Th2-related inflammatory axis and decreasing inflammatory mediator production.⁶ The substance's wound healing properties were evident in its ability to manage pressure ulcers, chronic wounds, and burns effectively.⁷ Furthermore, dietary consumption of olives within the Mediterranean diet was associated with decreased severity of inflammatory

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dermatological conditions, such as cystic acne and hidradenitis suppurativa.² These effects are primarily due to the antioxidant and anti-inflammatory properties of the phenolic compounds present in olives.⁸

Efficacy in Inflammatory Skin Conditions

Olive oil shows promise in managing inflammatory skin diseases like atopic dermatitis and psoriasis, highlighting its therapeutic potential.⁹ The phenolic compounds in olive oil, particularly oleuropein (Ole), hydroxytyrosol, and oleocanthal, have been identified for their potent anti-inflammatory and antioxidant properties. These compounds modulate the immune system by inhibiting key inflammatory pathways and reducing the production of cytokines involved in inflammatory responses.⁶

In atopic dermatitis, olive oil may restore skin barrier function and modulate the Th2 inflammatory response. This is since the component of olive oil, Ole, was found to drastically inhibit the expression of genes coding for cytokines related to Th2, IL-4, IL-5, IL-6, and ICAM-16. This inhibition is thought to be due to the structure of oleuropein, which is rich in terpenes. These can act as cyclooxygenases, which are the principal factors behind the anti-inflammatory activity due to inhibiting the nuclear factor kB (NF-kB) pathway.¹⁰ The fatty acids in olive oil contribute to maintaining the skin's moisture barrier, while its antioxidant components help in reducing oxidative stress, which is a contributing factor in the pathogenesis of atopic dermatitis.¹¹

For psoriasis, a condition characterized by hyperproliferation of keratinocytes and an inflammatory cascade involving Th1 and Th17 cells, olive oil's anti-inflammatory effects can help in modulating the immune

response.¹² The oleic acid in olive oil may also play a role in normalizing the skin cell turnover rate, thereby reducing the scaling and thickness associated with psoriatic plaques. This is due to the anti-inflammatory molecules and reactive oxygen species present in the oil. To expand, Luteolin-7-glucoside (LUT-7G), a flavonoid found in olives, was shown to modify both cell cycle regulation and keratinocyte differentiation in studies involving psoriasis mouse models. Additional investigation into this mechanism reveals that LUT-7G directly counteracts the proinflammatory and proliferative effects of several cytokines, such as IL-22 and IL-6, by blocking the nuclear translocation of activated STAT3 within these cells.¹³

Clinical trials and observational studies have provided evidence supporting the efficacy of topical olive oil in reducing the severity of lesions, pruritus, and scaling in patients with inflammatory skin conditions. However, despite these promising results, the exact molecular mechanisms through which olive oil exerts its dermatological effects remain partially understood, necessitating further detailed studies.⁸

Wound Healing and Skin Barrier Function

Olive oil's historical use in wound care and skin barrier enhancement is supported by its biochemical composition, which includes essential fatty acids, squalene, and various antioxidants. These constituents enhance skin hydration, elasticity, and integrity, aiding wound healing.¹⁴

The role of olive oil in enhancing skin barrier function is particularly significant in the context of dermatological care, and it is often recommended by dermatologists for its emollient properties. These properties improve skin hydration, which is crucial for maintaining the integrity of the epidermal

Table 1. Summary of Extracted Studies on Olive Oil and Its Derivatives in Dermatology

Author	Disease/Condition	Application Method	Type of Study	Number of Individuals	Adverse Events
Baumann LS	Cosmeceuticals	Topical	Review	N/A	None reported
Lorite-Fuentes I et al.	Hidradenitis Suppurativa	Diet	Cross-sectional	302	None reported
Alnemer F et al.	General skin health	Topical	Cross-sectional	1000+	None reported
Hussain Z et al.	Atopic dermatitis	Topical	Review	N/A	None reported
Al-Waili NS	Atopic dermatitis, Psoriasis	Topical	Single-blinded study	36	None reported
Huang WC et al.	Atopic dermatitis	Topical	Mouse model	N/A	N/A
Poljšak N et al.	Wound healing	Topical	Review	N/A	None reported
Michalsen A et al.	Psoriasis	Topical	Case series	12	None reported
Panahi Y et al.	Atopic dermatitis	Topical	RCT	52	None reported
Sklenarova R et al.	Oxidative stress	Topical	Experimental	N/A	None reported
Aparicio-Soto M et al.	Inflammation	Topical	In vitro study	N/A	None reported
Chhabra S et al.	Psoriasis	Topical	Review	N/A	N/A
Santangelo C et al.	Inflammation	Topical	Review	N/A	N/A
Pazyar N et al.	Wound healing	Topical	Review	N/A	None reported
Wanitphakdeedecha R et al.	Facial rejuvenation	Topical	Pilot study	30	None reported
Ah-Thiane L et al.	Acne	Diet	Case-control	235	None reported
Carrara M et al.	Skin disorders	Topical	Review	N/A	N/A
Lin TK et al.	Inflammation, skin barrier repair	Topical	Review	N/A	None reported
Viola P et al.	Skin protection	Diet	Review	N/A	None reported
Siegfried E et al.	Seborrheic dermatitis	Topical	Clinical study	19	Compromised skin barrier

barrier. This makes olive oil especially beneficial in conditions like eczema, where barrier dysfunction plays a critical role in

disease pathogenesis. However, dermatologists may advise caution in certain cases, as olive oil's oleic acid content can

disrupt the skin barrier in some individuals, particularly those with sensitive skin.¹⁵

In terms of wound healing, the phenolic compounds in olive oil are thought to promote the repair process by modulating the inflammatory response, enhancing fibroblast activity, and promoting collagen synthesis. These effects have been demonstrated in several preclinical and clinical studies. For instance, one study showed that the topical application of olive oil in a rat model accelerated wound closure by reducing wound size and enhancing epithelialization through increased fibroblast proliferation and collagen deposition.¹⁴ Another clinical trial involving human patients with pressure ulcers found that olive oil improved healing outcomes by significantly enhancing tissue regeneration and reducing inflammation.¹⁵ These findings underscore the potential of olive oil to accelerate the wound healing process through its anti-inflammatory and reparative properties, as observed in both animal models and clinical settings.⁷

Despite these positive findings, the literature still lacks large-scale randomized controlled trials that comprehensively evaluate the wound healing properties of olive oil in comparison to standard wound care treatments. Additionally, the optimal concentration and formulation of olive oil for wound care applications remain to be determined, highlighting a gap in the current research landscape.

Dietary Influences and Systemic Effects

The systemic effects of the Mediterranean diet, which includes the use of olive oil, have been associated with improved outcomes in various dermatological conditions, such as acne, psoriasis, and hidradenitis suppurativa. A French study with a small cohort linked the Mediterranean diet to reduced acne severity,

likely due to anti-inflammatory effects.¹⁶ Additionally, another study explored the role of olive oil in the Mediterranean diet and its specific impact on psoriasis, finding that the high content of polyphenols, such as hydroxytyrosol and oleuropein, contributed to the reduction of oxidative stress and inflammation, thereby improving skin health.⁶ These bioactive compounds, combined with the diet's rich intake of fruits, vegetables, and nuts, provide a potent anti-inflammatory and antioxidant mix, which has been shown to benefit dermatological conditions. Further research has supported olive oil's independent role, demonstrating its ability to reduce cytokine levels and inflammation in conditions such as atopic dermatitis and psoriasis, further contributing to improved skin outcomes.⁶

The consumption of olives and olive oil has been linked to a reduced incidence of chronic inflammatory diseases, including dermatological conditions like acne and hidradenitis suppurativa. The bioactive compounds in olive oil, such as polyphenols—particularly hydroxytyrosol and oleuropein—are known for their systemic anti-inflammatory effects, which help modulate immune responses and reduce inflammatory pathways involved in these skin conditions.⁶ However, recent research has shifted focus to olive mill wastewater, which is significantly richer in phenolic compounds compared to olive oil itself.¹⁷ A review highlighted the therapeutic potential of phenolics found in olive mill wastewater, including compounds like caffeic and ferulic acids, tyrosol, hydroxytyrosol, verbascoside, and oleuropein.¹⁷ These compounds have shown benefits in inflammatory skin diseases, wound healing, microbial activity, and even sun protection and antimelanoma properties.¹⁷ While olive oil remains valuable for its phenolic content and dermatological benefits, the higher concentration of these

bioactive compounds in olive mill wastewater suggests that it may offer even greater potential in dermatology.¹⁷ This supports further investigation into both olive oil and olive mill wastewater as complementary sources for treating inflammatory and oxidative skin conditions.¹⁷

Moreover, the antioxidants in olive oil, including vitamin E and polyphenols like hydroxytyrosol and oleuropein, play a crucial role in neutralizing free radicals and reducing oxidative stress, which are key contributors to skin aging and various dermatological disorders.¹⁸ A review by Lin et al. (2018) discussed olive oil's antioxidant effects, specifically highlighting its role in reducing oxidative stress and inflammation, both of which are linked to cellular damage and carcinogenesis in the skin.¹⁸ The review referenced multiple studies that demonstrated how olive oil's phenolic compounds protect against UV-induced oxidative damage, which is a significant risk factor for skin cancer.¹⁸ For example, one study showed that the topical application of olive oil reduced UVB-induced skin tumors in a mouse model by suppressing oxidative stress markers.¹⁸ Another study emphasized the protective effect of olive oil polyphenols against DNA damage in skin cells caused by UV radiation.¹⁸

In addition, hydroxytyrosol, a potent antioxidant found in olive oil, was highlighted for its ability to enhance cellular repair mechanisms and prevent the mutation of skin cells, potentially reducing the risk of skin cancer development.¹⁸ These findings suggest that the systemic and topical application of olive oil may offer protective benefits against oxidative damage in skin cells, contributing to healthier skin and a potential reduction in the risk of skin cancer, although further research is required to fully understand the mechanisms involved and to

confirm these benefits in human populations.¹⁸

While the dermatological benefits of dietary olive oil are supported by epidemiological and clinical studies, much of this research has primarily focused on the general health benefits of the Mediterranean diet, with less emphasis on specific dermatological outcomes. For instance, a large cohort study by Ah-Thiane et al. investigated the impact of the Mediterranean diet on acne severity, finding that individuals who consumed higher amounts of olive oil had a significantly lower risk of developing severe acne due to its anti-inflammatory properties.¹⁶ Another study by Viola and Viola explored the potential protective effects of virgin olive oil against skin aging, linking its antioxidant properties to improved skin elasticity and reduced wrinkle formation.¹⁹ However, many of these studies analyze the effects of the Mediterranean diet as a whole, making it difficult to isolate the specific role of olive oil in dermatological health. Future research should focus on distinguishing the effects of olive oil from other components of the Mediterranean diet to better understand its unique contributions to skin health, including its mechanisms in reducing inflammation and oxidative stress.

Potential Adverse Effects of Olive Oil in Dermatology

While olive oil is celebrated for its therapeutic properties, including anti-inflammatory and antioxidant benefits, it is also crucial to consider its potential adverse effects on skin health, particularly concerning skin barrier function. This section delves into the complications that may arise from the topical application of olive oil, with a focus on its role in exacerbating skin conditions such as seborrheic dermatitis.

Impact on Skin Barrier Function

Research has raised concerns about the impact of olive oil on skin integrity, primarily due to its oleic acid content. A controlled study involving 19 adults found that topical application of olive oil significantly compromised the skin barrier by increasing epidermal permeability and transepidermal water loss.³ This effect is attributed to oleic acid, which disrupts the lipid matrix of the skin's outer layer and can induce inflammation in keratinocytes through mechanisms involving N-methyl D-aspartate (NMDA) receptors.³ Other studies support these findings, showing that oleic acid weakens skin barrier function.⁷ While olive oil is often recommended for its emollient and antioxidant properties, these results suggest caution when using it topically, particularly for individuals with sensitive or compromised skin.¹⁰

Comparative Studies on Olive Oil and Other Vegetable Oils

Further research contrasts the effects of olive oil with other vegetable oils, providing a comparative perspective that highlights its unique risks.⁷ A randomized controlled trial observed that olive oil application led to a significant reduction in stratum corneum integrity and thickness and induced mild erythema.⁷ This was in stark contrast to sunflower oil, which exhibited protective effects on the skin barrier.⁷ These findings are critical in the context of dermatological recommendations, suggesting that olive oil might not always be suitable for individuals with sensitive or compromised skin barriers.⁷

Clinical Implications for Seborrheic Dermatitis

The implications of olive oil's adverse effects are particularly significant in the management

of seborrheic dermatitis, a condition where maintaining an intact and functional skin barrier is essential.²⁰ The exacerbation of seborrheic dermatitis by olive oil highlights a crucial area of concern.²⁰ It suggests that while olive oil offers several therapeutic benefits, such as anti-inflammatory and wound-healing properties, its use must be judiciously considered.²⁰ Tailoring the application of olive oil to individual patient needs and specific dermatological contexts is paramount to avoid adverse outcomes.²⁰

DISCUSSION

This review underscores olive oil's potential in dermatology, particularly in managing inflammation, enhancing wound healing, and improving skin barrier function. Key findings indicate that olive oil is effective in reducing erythema, scaling, and pain in patients with radiation-induced and contact dermatitis and shows promise in managing atopic dermatitis and psoriasis through its modulation of inflammatory pathways.⁵ The phenolic compounds in olive oil, such as oleuropein and hydroxytyrosol, are primarily responsible for these effects, given their strong antioxidant and anti-inflammatory properties.⁶

However, several limitations of this review must be considered. The studies included vary in design, with some focusing on preclinical models and others on small-scale clinical trials. This heterogeneity in study design makes it difficult to draw broad conclusions about the efficacy of olive oil across different dermatological conditions. In addition, the concentration and purity of olive oil used in these studies varied, influencing the consistency of the findings. The review lacks large-scale randomized controlled trials (RCTs) that directly compare olive oil to standard dermatological treatments, which

limits the strength of evidence supporting its use as a primary treatment option.

The potential for publication bias is another limitation. Studies demonstrating positive outcomes may be more likely to be published than those with neutral or negative results, skewing the overall assessment of olive oil's efficacy. Furthermore, while the review sheds light on olive oil's antioxidant and anti-inflammatory properties, the precise molecular mechanisms through which it exerts its effects remain insufficiently understood and require further research. For instance, olive oil's role in wound healing has been demonstrated in both preclinical and clinical settings, yet the optimal formulations and concentrations for specific dermatological applications remain unclear.⁷

Additionally, the review acknowledges potential adverse effects associated with olive oil, particularly regarding its oleic acid content.¹⁵ Research has shown that oleic acid can compromise the skin barrier by increasing transepidermal water loss and inducing inflammation in keratinocytes, raising concerns about its suitability for sensitive skin conditions such as seborrheic dermatitis.¹⁵ Comparative studies on other oils, such as sunflower oil, which demonstrates protective effects on the skin barrier, further underscore the need for caution when recommending olive oil in dermatology.⁷

CONCLUSION

In conclusion, olive oil and its derivatives represent a promising, multifaceted approach in dermatology, offering a range of benefits from symptom management in inflammatory conditions to enhancing wound healing and skin barrier function.¹⁸ The observed benefits underscore the potential of olive-based

products in dermatological care, aligning with the increasing interest in holistic and integrative treatment approaches.¹³ Their natural origin and historical use in medicinal practices further bolster their appeal in the modern therapeutic landscape, offering a blend of tradition and efficacy.⁹

The integration of olive oil and its derivatives into both dietary and topical therapeutic regimens could provide a comprehensive approach to dermatological care, emphasizing the importance of further research and clinical exploration.⁵ To maximize their therapeutic capabilities, future investigations should focus on identifying the specific bioactive compounds responsible for the beneficial effects, determining optimal formulations and dosing guidelines. Such research will pave the way for their evidence-based application in dermatology, enhancing patient outcomes and expanding the arsenal of treatments available to clinicians.

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Corresponding Author:

Zaryab Alam, BS
1304 Laurel Leaf Ln, Pearland, TX 77581
Phone: 713-702-3262
Email: Zalam098@tamu.edu

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