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Review

Essential Oils in the management of Psoriasis: Evidence-Based Perspectives

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Abstract

Psoriasis is one of the most challenging inflammatory skin conditions affecting millions of people worldwide. The growing research reveals how natural treatment options like plant based phytochemical approaches offer dual advantages maintaining therapeutic effectiveness while reducing side effects associated with conventional treatments. These innovative green solutions could potentially transform psoriasis management by delivering targeted relief with fewer adverse effects, marking an important step toward more personalized and sustainable treatment options. Essential oils present a particularly intriguing avenue for exploration, both as standalone treatments and in combination with traditional approaches. They are gaining attention for their potential to complement conventional psoriasis treatments. Their natural constituents show promise in addressing psoriasis symptoms while potentially minimizing adverse reactions. This mini review explores the promising role of plant-derived essential oils and their bioactive compounds in psoriasis care, examining their demonstrated effectiveness through both laboratory and clinical studies.

Keywords

Psoriasis, Essential oils, Phytochemicals, Bioactive compounds

Article History

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1. Introduction

Psoriasis is a common inflammatory immune-mediated disorder that can be crippling. Typically, it manifests as reddened, elevated skin lesions or "plaques" that may have silver or white scales covering them. Genetic polymorphisms affecting genes involved in the control of the epidermal barrier and/or the adaptive and innate immune systems are frequently present in those at risk of developing psoriasis. Chronic inflammation and the development of psoriatic plaques from hyper-proliferating skin cells are caused by both hereditary and environmental causes [1]. Approximately, 64.6 million people in the world are suffering from this disease which is about 811 cases per 100,000 of the population. Its prevalence varies in different geographical regions of the world as North America and Western Europe have the highest prevalence rates as compared to Asia and Western Pacific regions [2,3].

From the ancient Greek and Egyptian societies to the Roman Empire, essential oils have been utilized extensively for ages for cosmetic, spiritual, religious, and therapeutic purposes. Essential oil extraction was thought to have been perfected by the Egyptian culture for use in cosmetics, perfumes, and mummification. They have been widely used in traditional medicine by the ancient Chinese, Persians, and Indians to cure a range of mental and physical ailments, as well as spiritual practices. Additionally, essential oils were utilized in ancient Chinese medicine and Ayurveda to balance the body's energy and encourage healing [4]. Essential oils are concentrated, volatile plant extracts that maintain the unique scent and medicinal qualities of the plants they are derived from. These aromatic molecules are obtained by methods like distillation or pressing and are employed in a variety of ways, including aromatherapy, cosmetics, and natural medicine. Depending on the botanical source, the main component of essential oils might vary, but it usually comprises of a complex blend of volatile organic compounds such alcohols, terpenes, phenols, and esters. Terpenes, such as limonene, pinene, myrcene, and linalool, are among the most prevalent components of essential oils and are recognized for their therapeutic and fragrant properties [5].

In this mini review, we have reviewed the effectiveness of essential oils for the management of psoriasis and the limitations related to essential oil based psoriasis therapy.

2. Methodology

This mini-review synthesizes current evidence on essential oils' anti-psoriatic mechanisms through a targeted literature search in PubMed, ScienceDirect, and Google Scholar (2000–2024), using keywords like "essential oils," "psoriasis," and "anti-inflammatory pathways." Inclusion criteria prioritized peer-reviewed studies (in-vitro, in-vivo) detailing bioactive compounds (e.g., linalool, boswellic acids etc.) and their effects on psoriasis-related pathways, immunomodulation (Th17/IL-23 axis), keratinocyte proliferation (MAPK/EGFR), and skin barrier repair. Excluded were non-mechanistic studies or those on unrelated dermatoses.

3. Pathogenesis of Psoriasis

Psoriasis is a chronic, immune-mediated inflammatory skin disorder characterized by epidermal hyperplasia, aberrant keratinocyte differentiation, and immune dys-regulation, primarily driven by the IL-23/Th17 axis (Figure 1) [6,7]. Genetic predisposition plays a crucial role, with genome-wide association studies identifying susceptibility loci such as PSORS1 (containing HLA-Cw6), IL23R, and IL12B, which influence immune responses and epidermal function [8]. Environmental triggers, including trauma, infections (e.g., streptococcal pharyngitis), and stress, activate plasmacytoid dendritic cells (pDCs) to produce interferon-α (IFN-α), initiating a cascade of innate and adaptive immune responses [9]. Myeloid dendritic cells (mDCs) subsequently secrete IL-12 and IL-23, promoting the differentiation of Th1 and Th17 cells, respectively [10]. Th17 cells produce IL-17A, IL-17F, and IL-22, which stimulate keratinocyte proliferation via STAT3 and NF-κB signaling while inhibiting terminal differentiation, leading to acanthosis and parakeratosis [6]. Additionally, TNF-α amplifies inflammation by enhancing endothelial adhesion molecule expression and sustaining DC activation [11]. Auto-antigens such as LL-37 (cathelicidin) and ADAMTSL5 may further contribute to disease perpetuation by activating auto-reactive T-cells in genetically susceptible individuals [12]. The resulting feed-forward loop of cytokine production (IL-23, IL-17, TNF-α) and keratinocyte hyper-proliferation establishes chronic psoriatic plaques, with histological hallmarks including Munro's micro-abscesses and dilated papillary blood vessels. Recent therapeutic advances targeting these pathways, particularly IL-17 and IL-23 inhibitors, underscore the centrality of this immunological axis in disease pathogenesis [6].

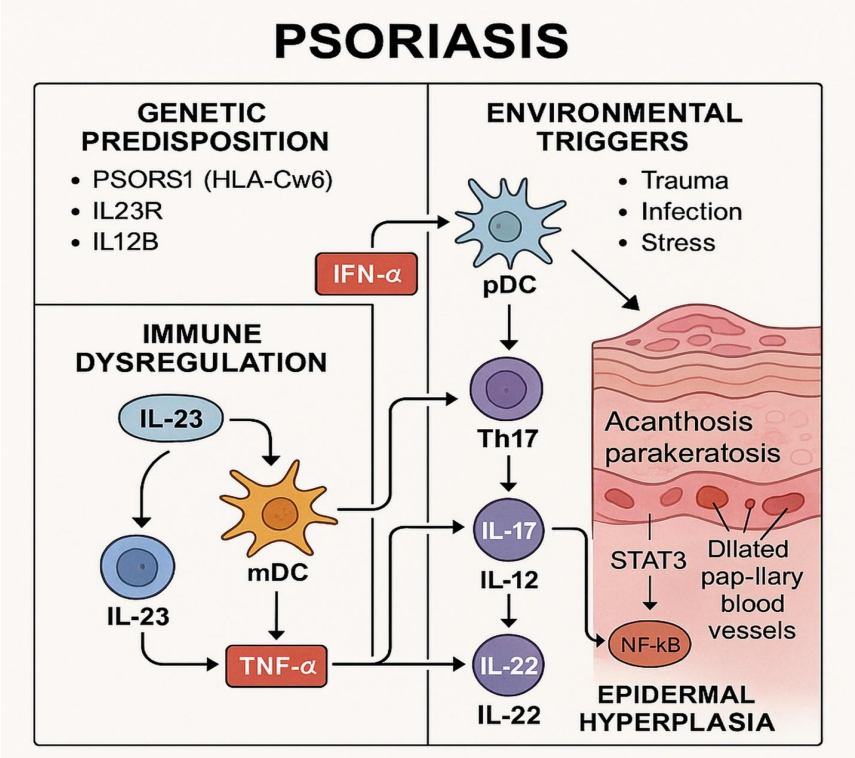

Figure 1. Pathogenesis of psoriasis.

4. Treatment of Psoriasis

Psoriasis can lead to a range of unpredictable and diverse complications. So this is typically managed using NSAIDs, disease-modifying antirheumatic drugs (DMARDs) like methotrexate and sulfasalazine, immune-suppressants such as azathioprine and cyclosporine, and advanced biologic therapies like exosome treatment [13,14]. Since Psoriasis is a chronic ailment, it requires lifelong therapy for the diseased patients. Hence, all the treatments used must ensure the highest standards of quality and patient safety. While modern psoriasis treatments primarily rely on synthetic drugs, these options often only address symptoms rather than curing the disease, and many come with significant side effects that can impact patient safety and treatment compliance. For instance, prolonged corticosteroid use may lead to complications such as stomach ulcers, thinning of the skin and bones, and even early-onset cataracts. Topical vitamin D analogs, though effective, can irritate the skin, while extended use of salicylic acid on the scalp may contribute to hair loss. Coal tar preparations, another common treatment, often cause excessive skin dryness and increased photosensitivity. Phototherapy, though beneficial, requires strict medical supervision due to risks ranging from severe burns to an elevated likelihood of skin cancer with long-term exposure. Given these potential complications, careful safety monitoring remains a critical aspect of psoriasis management to minimize risks while maintaining therapeutic effectiveness [15,16].

In recent years, herbal medicines have experienced a resurgence in popularity, largely due to its favorable safety profile compared to conventional drug treatments [17]. Traditional healing systems in many countries have utilized botanical remedies for centuries, and modern research is now actively investigating these ancient practices. Contemporary scientific studies are working to elucidate the pharmacological mechanisms underlying these plant-based therapies, bridging the gap between traditional knowledge and evidence-based medicine [18]. Among herbal interventions, essential oils have gained particular interest in psoriasis management due to their anti-inflammatory and keratinocyte-modulating properties. They demonstrate potential in reducing plaque thickness and erythema, likely through suppression of pro-inflammatory cytokines (IL-17, TNF-α) and promotion of epidermal barrier repair [19,20]. In following section we will discuss some essential oils and their evidence based potential for the topical management of psoriasis. Table 1 shows a list of essential oils their botanical origin, major constituents and investigational studies conducted.

5. Essential Oils for Psoriasis

Essential oils offer several potential benefits in the management of skin diseases, particularly psoriasis, due to their natural origin, multi-target mechanisms, and favorable safety profile compared to conventional treatments [21]. When applied topically (properly diluted), most EOs have low risk of systemic side effects, unlike oral immune-suppressants (e.g., methotrexate) or biologics [22]. Psoriasis often requires lifelong treatment; EOs like frankincense and myrrh have been used traditionally for extended periods without major tolerance issues [23]

They have shown promising potential in managing psoriasis via several complementary mechanisms including anti-inflammatory, antioxidant, inhibition of keratinocyte hyper proliferation, restoration of normal differentiation by inhibition of antimicrobial peptides (β-defensin2) and the hyper-proliferation marker keratin 17 [24]. Other mechanism is the inhibition of different signaling pathways, such as nuclear translocation of nuclear factor kappa B (NF-κB), mitogen-activated protein kinase (MAPK), signal transducer and activator of transcription (STAT), and reduction of inflammatory reactions [25].

5.1 Black Cumin Essential Oil

Black cumin (*Nigella sativa*) is an annual plant found in southern Europe and some regions of Asia, such as Syria, Turkey, Saudi Arabia, Pakistan, and India. It is a member of the Ranunculaceae family. Saponins, flavonoids, cardiac glycosides, thymoquinone, thymol, limonene, carvacrol, p-cymene, alpha-pinene, 4-terpineol, longifolene, t-anethole benzene, isoquinoline, and pyrazole alkaloids, as well as unsaturated fatty acids like linoleic acid, oleic acid, and palmitic acid, are among the various active pharmaceutical ingredients found in Black cumin seeds [26]. According to published data, animal models have shown the therapeutic effects of Black cumin on different skin conditions including skin inflammation [27], skin pigmentation [28], acne vulgaris [29] and burn wound healing [30].

A study conducted by Ebtsam and colleagues examined the effects of black seed oil on psoriasis-like skin lesions induced by imiquimod in male albino rats. The researchers found that the oil effectively alleviated psoriatic symptoms through several key mechanisms. It significantly reduced keratinocyte hyper-proliferation, bringing skin cell growth back to normal levels, while also decreasing epidermal thickening to improve skin texture. Additionally, the oil helped correct abnormal skin cell differentiation, preventing the formation of characteristic flaky, scaly patches. Beyond these structural improvements, Black cumin oil demonstrated potent anti-inflammatory properties by suppressing pro-inflammatory mediators, thereby interrupting the chronic inflammatory processes that drive psoriasis progression. These findings suggest that black seed oil holds considerable promise as a natural therapeutic option for psoriasis, addressing both the excessive skin cell production and underlying inflammation that define this challenging skin condition [31]. Similar results were observed by Ayat Fadel Hussieny in their histological study using thin skin of adult male mice [32].

5.2 Lavender Essential Oil

Lavender (*Lavandula angustifolia*) is a member of Labiatae (Lamiacae) family. It has been extensively employed in the cure and treatment of a number of disorders [33]. Results of GC/MS shows that lavender oil contains 26 constituents, among which linalyl acetate, linalool, α-pinene, caryophyllene, β-myrcene, p-cymene, limonene, cineol, borneol, terpinene-4-ol, geranyl acetate and camphene were identified [34]. Lavender essential oil has been found to have antioxidant and biocidal activity (antiprotozoal, insecticidal, antimicrobial, nematicidal, and allelopathic), as well as other potential therapeutic effects such as neuro-protective, anxiolytic, antithrombotic, improving sleep quality, analgesic and anti-inflammatory [35].

Lavender oil (2% and 10% formulations) showed potential for psoriasis treatment, with a 10% formulation improving PASI scores by 73.67% and normalizing 87% of Th-17 cytokines. Its active components, limonene and linalyl acetate exhibited strong binding to psoriasis targets. At 2% concentration, limonene achieved 64% PASI improvement while linalyl acetate reached 47.61%. Both reduced TNF-α and IL-1β, but only limonene significantly lowered IL-17 and IL-22. Limonene corrected epidermal hyperplasia and parakeratosis, while linalyl acetate restored granulosis. Molecularly, limonene down-regulated NF-κβ, ccr6, and IL-17, whereas linalyl acetate only affected NF-κβ. 10% formulation caused mild irritation while 2% was non-irritating, suggesting safer therapeutic potential [36].

5.3 Centella asiatica Essential Oil

Gotu kola (*Centella asiatica*) is a perennial herbaceous plant that belongs to Apiaceae family and is found throughout tropical and subtropical areas. For millennia, C. asiatica has been used in traditional medicine, especially Traditional Chinese Medicine, to treat a wide range of illnesses, such as gastrointestinal issues, skin disorders, and neurodegenerative diseases [37]. It owes its medicinal properties to a unique group of bioactive compounds called centelloids. These pentacyclic triterpenoids include four particularly important constituents: asiaticoside, madecassoside, asiatic acid, and madecassic acid. Beyond these key compounds, the plant also produces valuable oleanane-type and isothankunic acid saponins, with centellasaponin-D and terminolic acid being notable examples. When examining its chemical composition, *Centella asiatica* typically contains a modest 0.1% essential oil content alongside a more substantial 1-8% concentration of saponins, which collectively contribute to its therapeutic effects [38]. Owing to its therapeutic qualities, it has long been used to treat a range of dermatological disorders, including psoriasis, eczema, leprosy, wounds, burn injuries, scars, lupus, and varicose ulcers [39].

In an animal study the potential of madecassoside ointment for treating psoriasis-like symptoms was investigated. Researchers used an imiquimod-induced psoriasis model in BALB/c mice, focusing on the IL-23/IL-17 pathway, a key driver of psoriasis inflammation. The results were promising: real-time PCR analysis showed that madecassoside significantly lowered IL-23 and IL-17 mRNA levels. Microscopic examination of skin tissue (using H&E staining) and cell proliferation tracking (via BrdU labeling) both confirmed reduced keratinocyte overgrowth which is a hallmark of

psoriatic plaques. Additionally, flow cytometry detected fewer Th17 immune cells, which are responsible for sustaining the inflammatory cycle. Together, these findings suggest that madecassoside ointment may alleviate psoriasis by targeting the IL-23/IL-17 axis at multiple levels [40].

In another study, Pei Lin and team evaluated *Centella asiatica's* therapeutic potential for inflammatory skin conditions through *in-vitro* and *in-vivo* investigations, focusing on the JAK/STAT3 pathway's role in psoriasis treatment. Researchers extracted and measured antioxidant activity via DPPH, ABTS, and FRAP assays. Using LPS-induced HaCaT cells, they evaluated oxidative stress, inflammation, and skin barrier function, finding *Centella asiatica* extracts reduced ROS while boosting Glutathione and Superoxide Dismutase levels. The ethyl acetate extract showed superior efficacy in suppressing inflammatory cytokines (IFN-γ, IL-6, TNF-α) and enhancing barrier proteins (AQP3, FLG). Western blotting confirmed CAE and n-hexane extract (CAH) inhibited NF-κB and JAK/STAT3 pathways. In IMQ-induced psoriatic mice, CAE (40 mg/mL) reduced scaling and inflammation [41].

5.4 Chamomile Essential Oil

For thousands of years, German chamomile (*Matricaria chamomilla* L.) has been revered as a medicinal superstar across ancient civilizations from Egypt to Greece and Rome. This remarkable plant, belonging to the Compositae family, contains a rich blend of bioactive compounds that explain its therapeutic value. It has diverse phytochemical profile, including soothing flavonoids, aromatic volatile oils, various terpenes, and beneficial organic acids [42]. Traditionally valued for digestive relief, this versatile herb has demonstrated effectiveness in treating stomach discomfort, muscle cramps, skin irritations, and minor infections. Modern science continues to validate what ancient healers knew - that chamomile's complex chemistry makes it a gentle yet powerful remedy for multiple health concerns, particularly in dermatological and gastrointestinal applications [43].

Major constituents of chamomile essential oil are camphor, 3-carene, β-myrcene and Chamazulene [44]. Chamazulene found in chamomile essential oil, is found to be responsible for combating psoriasis. Extracted from the plant's flowers during oil production, this remarkable phytochemical works its magic through a clever anti-inflammatory mechanism. By the inhibition of lipoxygenase enzymes, chamazulene effectively blocks the production of leukotriene B4 (LTB4) which is directly contribute to characteristic thick, scaly plaques [45].

A study investigated the anti-inflammatory properties of chamomile essential oil for psoriasis treatment using a multi-approach analysis. GC-MS first identified its bioactive components, followed by network pharmacology to predict its therapeutic pathways. Researchers validated findings using clinical psoriasis samples and HaCaT keratinocytes, where chamomile essential oil effectively reduced inflammation triggered by IL-22/TNF-α/LPS. The oil notably suppressed PI3K/Akt/mTOR and p38 MAPK pathways which are considered key drivers for psoriatic inflammation. *In-vivo* tests using an imiquimod-induced psoriasis mouse model further confirmed its efficacy, showing reduced skin lesions, lower PASI scores, and decreased inflammatory cytokines. Histological analysis (HE staining) supported these results, demonstrating its potential as a natural treatment for psoriasis by targeting multiple inflammatory pathways while improving skin condition [46].

5.5 Perilla Essential Oil

Perilla (*Perilla frutescens*), a medicinal herb from the mint family (Lamiaceae), has been known for centuries across Asia for both its therapeutic properties and culinary uses. This plant plays a significant role in traditional Chinese medicine, where it has been utilized as dried leaves, stalks, and seeds for their medicinal benefits. Modern research has revealed its impressive range of health benefits, including anti-inflammatory, antibacterial, anti-fungal, anti-allergic, and even showing potential against serious conditions like HIV and cancer [47]. The chemical constituents in Perilla essential oil are perillaldehyde, limonene, transcaryophyllene, cis, trans-α-farnescene and linalool [48].

A study conducted by Xu and co-workers explored how Perilla essential oil could help soothe imiquimod induced psoriasis-like symptoms in BALB/c mice by targeting multiple inflammatory pathways. It reduced neutrophil activity, as shown by decreased levels of Ly-6G, a key marker of immune cell activation. It also suppressed critical inflammatory mediators, including IL-1, IL-6, iNOS, and COX-2, which contribute to skin irritation and plaque formation. Additionally, it lowered the expression of psoriasis-driving cytokines like IL-17, IL-23, and NF-κB, further calming immune hyperactivity. Furthermore, the oil also down-regulated mRNA for pro-inflammatory signals such as IL-22, IFN-α, and IFN-γ, which are known to worsen psoriasis symptoms [49].

Table 1. Essential oils their botanical origin, major constituents and investigational studies.

Plant	Essential oil	Major Phytoconstituents	Animal Model/ Cell line	Result	Mechanism	Reference
Nigella sativa	Black Cumin Essential Oil	Thymoquinone, thymol, limonene, carvacrol, p-cymene, alpha-pinene, 4-terpineol, longifolene, t-anethole benzene, isoquinoline, and pyrazole alkaloids	Male albino rats	Reduction in keratinocyte hyper-proliferation and epidermal thickening to improve skin texture		[31]
			Male albino mice	Alleviated psoriasis like inflammation and epidermal and dermal changes		[32]
Lavandula angustifolia	Lavender Essential Oil	Linalyl acetate, linalool, α-pinene, caryophyllene, β-myrcene, p-cymene, limonene, cineol, borneol, terpinene-4-ol, geranyl acetate	BALB/c mice	Significant recovery in PASI score and decreased psoriasis like skin inflammation	Significant recovery in Th-1 specific TNF-α and IL-1β as well as down-regulation of NF-κβ, ccr6 and IL-17	[36]
Centella asiatica	Gotu Kola Essential Oil	Asiaticoside, madecassoside, asiatic acid, and madecassic acid	BALB/c mice	Amelioration of skin inflammation and abnormal keratinocyte	Reduction in IL-23, IL-22, IL-17A and Th17 cells.	[40]
			HaCaT cells and mice model	Significant reduction in skin scale, blood scab skin lesions	Down-regulation of inflammatory factors (IFN-γ, CCL20, IL-6 and TNF-α) via inhibition of NF-κB and JAK/STAT3 pathways	[41]
Matricaria chamomilla	Chamomile Essential Oil	Chamazulene, camphor, 3-carene and β-myrcene	BALB/c mice and HaCaT cells	Alleviation in Psoriatic-Like skin inflammation and improved PASI score	Downregulation of PI3K/Akt/mTOR and p38MAPK pathways and inflammatory cytokines	[46]
Perilla frutescens	Perilla Essential Oil	Perillaldehyde, limonene, transcaryophyllene, cis, trans-α-farnescene and linalool	BALB/c mice	Amelioration of psoriasis-like skin lesions	Down-regulation of lymphocyte antigen 6 complex locus G6D (Ly-6G) and inflammatory factors IL-1, IL-6, iNOS and COX2	[49].

6. Limitations

However, because most herbal medicines lack sufficiently comprehensive clinical-based investigations and safety profiles, using topical herbal therapies for an extended period of time may be dangerous. Additionally, common side effects of topical plant-based medications include burning, itching, redness, skin irritation, photosensitization, and occasionally hepatotoxicity and nephrotoxicity. All of these result from the existence of impurities, additives, and incorrectly stated purity information, which can significantly hinder their efficient use [50]. This indicates that in order to fully realize the potential applications of botanical active components, a standardized platform for evaluating their quality is still required [18].

7. Conclusion

Psoriasis has emerged as a significant global health challenge, with its complex pathogenesis. While current medical therapies can be effective, many come with side effects that make long-term use challenging for patients. This reality has sparked growing interest in plant-based alternatives that may offer gentler solutions. Essential oils present a particularly intriguing avenue for exploration, both as standalone treatments and in combination with traditional approaches. They are gaining attention for their potential to complement conventional psoriasis treatments. Their natural constituents show promise in addressing psoriasis symptoms while potentially minimizing adverse reactions.

However, it's important to recognize that essential oil therapy isn't without limitations, questions remain about optimal formulations, concentrations, and long-term effects. Future studies should focus on optimizing bioavailability through nanoencapsulation or lipid-based carriers to enhance skin penetration and stability of volatile compounds. Combining essential oils with conventional treatments (e.g., topical corticosteroids or phototherapy) could yield synergistic effects, potentially reducing the required dosage of pharmaceuticals and minimizing side effects. Additionally, personalized approaches may emerge, as genetic and microbiome profiling could identify patients most likely to benefit from specific essential oils blends. The medical community's increasing openness to botanical solutions reflects an important shift toward more holistic, patient-centered psoriasis management. As research continues, essential oils may well become valuable tools in our fight against this persistent skin condition, offering hope for those seeking alternatives to conventional treatments.

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