

# Medicinal Plants for Treatment of Atopic Dermatitis

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## Abstract

For centuries, herbal medicine has been utilized to treat a variety of skin diseases, including eczema, psoriasis, herpes, and cancer. This practice is widespread in rural areas due to its perceived efficacy and minimal side effects. Atopic dermatitis is a multifaceted condition that causes inflamed and itchy skin and is commonly found in children but can affect adults as well. Bioactive lead compounds from natural products are used for complementary and alternative therapy in managing atopic dermatitis. For example, *Cassia senna*, a plant used in Asia for skin issues, has promising pharmacological effects that could alleviate atopic dermatitis symptoms. Literature shows its potential as an alternative therapy. This article offers comprehensive information on how to manage eczema, including siddha medicine derived from plants. To effectively treat skin diseases, it is essential to comprehend the potential benefits and limitations of herbal medicine.

**Keywords:** Eczema • Plants • Herbs with anti-inflammatory activity

## Introduction

Skin conditions are a common problem that affects people all over the world and can have a significant impact on their quality of life, leading to a range of psychosocial difficulties [1,2]. One such condition that affects a large number of people is atopic dermatitis. Atopic dermatitis is a chronic skin disease that is characterized by inflammation, itching, and recurring dry patches on the skin, often accompanied by lesions that can be triggered by external factors like allergens or irritants [3,4]. Atopic dermatitis, commonly known as eczema, is a persistent skin condition that influences people of all ages globally and is believed to be caused by a combination of genetic factors, immune system deregulation, environmental dysfunction, and microbial dysbiosis [5]. The immune system of the affected person overreacts to certain triggers, leading to inflammation and skin damage. The resulting inflammation, disrupted sleep patterns, and accentuate can make the condition worse. Atopic eczema is a complex disease, and there is no permanent cure for it yet. However, there are various treatment options available that can help manage the symptoms and improve the quality of life of the affected person [6-8]. These include avoiding triggers, moisturizing the skin regularly, using topical medications like corticosteroids or calcineurin inhibitors, and in severe cases, using systemic medications like immunosuppressants or biologics. Natural remedies, such as *Terminalia chebula*; *Terminalia bellirica*; *Cuminum cyminum*; *Celastrus paniculatus*; *Mesua ferra* and *Elettaria cardamom*, a plant, seed, fruit, flower renowned for

its anti-inflammatory, antimicrobial, antioxidant, and wound-healing benefits, can offer a safer option for managing atopic dermatitis [9-11].

## Literature Review

We conducted an extensive literature review of herbal treatments for atopic dermatitis, utilizing respected scientific databases such as Google Scholar, Research Gate, PubMed, and Science Direct. To validate our research, we chased citations, drew from the author's knowledge, and conducted individual research on the plants mentioned in the studies. We obtained the taxonomical details of these plants from reliable online databases such as <http://www.worldfloraonline.org/> or <http://www.theplantlist.org/>, and utilized ChemDraw software and the PubChem website to create chemical structures. Our findings are based on the latest research and will assist you in identifying effective herbal treatments for atopic dermatitis.

## Medicinal plants traditionally used to treat skin diseases

People diagnosed with eczema have a dysfunctional skin barrier that causes various problems. This skin condition is a chronic and relapsing inflammatory disease associated with intense itching, dryness, and flaking. The cells that make up our skin are essential for maintaining optimal skin hydration, and those with eczema tend to have dry skin due to the dysfunction in the skin barrier [12]. Atopic

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dermatitis, a common form of eczema, is relatively high, with a lifetime prevalence of about 15%-30% in children and 2%-10% in adults. Additionally, around 60% of cases occur within the first year of life, and the incidence is more common in rural areas than urban areas, indicating a link between lifestyle and environmental factors in AD mechanisms. Atopic dermatitis is part of the triad known as the 'Atopic march,' which relates to the association between patients with atopic dermatitis, asthma, and allergic rhinitis. Patients with severe atopic dermatitis have a 50% chance of developing asthma and a 75% chance of developing allergic rhinitis. Various factors, including exposure to allergens, irritants, and extreme temperatures, can trigger the onset of eczema. The list of potential environmental irritants that can cause allergic reactions leading to an eczema flare is extensive. Common triggers of eczema include extended exposure to dry air, extreme heat or cold, some types of soap, shampoo, bubble bath, body wash, facial cleansers, laundry detergents. In addition, fabric softeners with chemical additives, certain fabrics like wool or polyester in clothing, sheets, surface cleaners, disinfectants, natural liquids like the juice from fruit, vegetables, and meats, fragrances in candles, metals (especially nickel) in jewelry. Moreover, utensils, formaldehyde found in household disinfectants, some vaccines, glues, and adhesives, isothiazolinone, an antibacterial found in personal care products like baby wipes. Cocamidopropyl betaine used to thicken shampoos and lotions, and paraphenylene-diamine used in leather dyes and temporary tattoos.

Research shows that there is a genetic component to atopic dermatitis. Filaggrin gene mutation is one common observation vital for skin cell maturity. The Filaggrin gene creates tough, flat corneocytes that form the outermost protective layer of skin. In a patient with normal skin cells, the corneocytes are tightly packed in an organized manner. However, a patient with a filaggrin mutation will have a dysfunctional skin barrier due to the haphazard organization of the skin cells. This dysfunction causes a 'leaky' skin barrier, allowing water loss and decreased protection from harmful substances. People with eczema also have reduced numbers of beta-defensins in the skin, which are host defense peptides vital for fighting certain bacteria, viruses, and fungi. A decrease in these peptides leads to increased colonization and infection, especially with staph aureus. The histopathology seen in atopic dermatitis is non-specific. In the acute phase, lesions characterized by intensely pruritic, erythematous papules, histopathology reveals mild epidermal hyperplasia, infiltrations of lymphocytes and macrophages along the venous plexus in the dermis, and intercellular edema of the epidermis (spongiosis). Lesions biopsied in chronic atopic dermatitis may reveal increased hyperplasia and hyperkeratosis of the skin, characterized by lichenification and fibrotic papules. There is also persistent dermal inflammatory cell infiltration with lymphocytes and macrophages (Figure 1).



**Figure 1.** The lancet common atopic dermatitis.

The chronic phase lacks the edema or spongiosis present in acute phase lesions. Eczema almost always includes itchy skin. The scientific term for itch is "pruritus." The itch can range from mild to moderate, and sometimes, it gets so bad that people scratch it until it bleeds. This is called the itch-scratch cycle. Symptoms of eczema often include itch, dry, sensitive skin, inflamed, discolored skin, rough, leathery, or scaly skin appearing as scaly patches, oozing or crusting, and areas of swelling. Eczema can appear red in lighter skin, whereas people of color may experience eczema as ashen skin, grey skin, darker brown, or purple. The diagnosis of atopic dermatitis is based on the history and physical examination findings. Exposure to possible exacerbating factors, such as aeroallergens, irritating chemicals, foods, and emotional stress, should be investigated. There are no specific laboratory findings or histologic features that define atopic dermatitis. Although elevated IgE levels are found in up to 80 percent of affected patients, IgE levels are also elevated in patients with other atopic diseases. The diagnosis is typically clinical based on the appearance of the rash and history. Routine lab work is not usually indicated. If unsure of the diagnosis, allergy testing and patch testing may be performed. The differential diagnosis for atopic dermatitis includes many eczematous dermatitis such as contact dermatitis, cutaneous fungal infections, seborrheic dermatitis, drug eruptions, scabies, psoriasis, ectodermal dysplasia, hyperactive IgE syndrome, Netherton's syndrome, and Wiskott-Aldrich syndrome. It is imperative to properly diagnose eczema to provide the correct treatment and prevent further complications.

### ***Mesua ferrae***

This particular plant possesses incredible medicinal properties. Its flowers, stamens, seeds, roots, bark, and oils are known to provide relief for a variety of ailments, including digestive issues, blood disorders, edema, heart and bladder pains, and more. The leaf can effectively treat snakebites, while the flower acts as an astringent. Dried flowers can aid in curing coughs and stomach problems, and crushed anthers and rock sugar can offer relief for hemorrhoids and cracked skin. The seed oil is effective in treating inflammation, scabies, eczema, and infected sores. It is truly an all-in-one solution that you may find to be quite helpful (Figure 2).



**Figure 2.** Therapeutic flower from *Mesua ferrea* explored for the treatment of eczema.

### **Piper nigrum**

Originating from South Western India, black pepper is a woody perennial vine that boasts various compounds with potent antimicrobial and antiviral properties such as piperine, alkamides, piptigrine, wisanine, dipiperamide D, and dipiperamide E. Its piperine content has made it a highly recommended treatment for eczema in India due to its immune-boosting benefits. Additionally, black pepper has proven effective against a range of skin allergies and conditions (Figure 3).



**Figure 3.** Therapeutic seed from *Piper nigrum*: Explored for the treatment of eczema.

### **Myristica fragrans**

*Myristica fragrans* is a plant used in traditional medicine to cure various diseases, including anxiety, nausea, diarrhea, cholera, stomach cramps, parasites, paralysis, and rheumatism. Its essential oil has potential antioxidant, antimicrobial, anti-inflammatory, anti-ulcer, anticancer, aphrodisiac, and various other activities. The oil yield of nutmeg kernels can be extracted through various methods, and its constituents include monoterpenes (sabinene,  $\beta$ -pinene,  $\beta$ -terpineol, p-menth-8-en-1-ol, and terpinen-4-ol), phenylpropene (eugenol, methyl eugenol, and myristicin), sesquiterpenes (germacrene D and  $\beta$ -bergamotene), and other compounds. Additionally, *Myristica fragrans* is effective in treating a range of skin allergies and conditions (Figure 4).



**Figure 4.** Therapeutic fruit from *Myristica fragrans* explored for the treatment of eczema.

### **Kadarpassi chooranam**

Marine algae are a valuable source of bioactive compounds, such as carotenoids, vitamins, and fatty acids that offer numerous benefits. These benefits range from anti-inflammatory, anti-cancer, and antioxidant properties to anti-viral, anti-allergic, and anti-obesity activities. A diverse range of marine organisms produces these compounds, including green algae, brown algae, red algae and various phytoplankton. In particular, sea kelp (Seaweed), a nutrient-rich alga that thrives in saltwater, offers many benefits for the skin. It protects against environmental stressors, reduces inflammation, hydrates, detoxifies, and promotes collagen and elastin production. For example, Kadarpassi chooranam, a Siddha medicine standardized as per the Siddha pharmacopeia standard protocol guidelines, has been found to have antioxidant, anti-inflammatory, and anti-cancer properties due to the presence of alkaloids, phenols, flavonoids, cardiac glycosides, saponins, tannins, and diterpenes. Sea kelp is a versatile ingredient in various beauty products, making it an excellent option for those with skin conditions seeking optimal

benefits. Marine algae, specifically seaweed and microalgae, have the potential to fight skin disease. However, due to a lack of standardization and proper regulation, it is difficult to determine which products are effective. Nevertheless, there is no evidence of harm from such extracts. It contains various phytochemical bioactive compounds and has the potential as a drug candidate for human use.

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## Discussion

This comprehensive analysis presents a detailed overview of the effectiveness and safety of herbal medicine in treating atopic dermatitis. This chronic inflammatory skin condition affects a significant proportion of the population. Atopic dermatitis is typically treated with conventional medications such as topical corticosteroids, calcineurin inhibitors and oral immunosuppressant's [13]. However, some patients may not be suitable for these treatments due to intolerable side effects or inadequate response. As such, herbal medicine has been proposed as an alternative or adjunctive therapy for atopic dermatitis. The analysis is based on a systematic review of previous studies, including randomized controlled trials, which investigated the use of herbal medicine for atopic dermatitis [14]. The findings suggest that herbal medicine can be an effective treatment option for atopic dermatitis, with better outcomes than a placebo regarding total effective rate, symptom scores, quality of life, and dose of topical treatment. However, it is important to acknowledge the low methodological quality of some of the studies, which may have introduced reporting biases and limited the generalizability of the findings. A clear basis for the safety profile of herbal medicine is necessary to promote the use of herbal medicine in medical treatment particularly in terms of herb-drug interaction [15]. Evaluations of the herb-drug interaction between the drugs currently used and the herbal medicines frequently used in treating atopic dermatitis are highly needed.

Furthermore, more research is required to understand the therapeutic mechanism of herbal medicine for atopic dermatitis, with a particular focus on the skin axis. Understanding the skin axis's role in the therapeutic mechanism of herbal medicine can provide insights into the efficacy and safety of herbal medicine. In addition, high-quality, rigorous, randomized controlled trials are needed to confirm the efficacy and safety of herbal medicine in treating atopic dermatitis [16,17]. These trials should have a larger sample size and longer follow-up duration to better assess herbal medicine's long-term efficacy and safety. Despite the limitations of the research, this overview provides valuable insights into the use of herbal medicine in treating atopic dermatitis [18]. The findings will contribute to the evidence-based use of herbal medicine to optimize tailored care for patients with atopic dermatitis. Moreover, this overview's results will guide future studies' design and provide researchers with insights into the urgent research challenges in this area.

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## Conclusion

Despite ongoing review about their effectiveness in treating skin diseases, herbal therapies remain popular due to their perceived safety and affordability. However, standardization and side effects continue to pose significant challenges. Ethnobotanical literature presents an opportunity for research into potential pharmaceutical raw materials. Medicinal plants have great potential for treating skin conditions, but deforestation and habitat degradation threaten their availability. Medicine plants exhibits pharmacological properties that support AD management, and *in vitro* and *in vivo* studies could unlock its potential as evidence-based complementary and alternative medicine. Medicinal plants with specific therapeutic abilities for eczema have anti-inflammatory and immunomodulatory effects, modulate physiological functions, and act as humectants or moisturizers.

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## Limitation and Future look

Dermatitis affects a significant portion of the global population and is known to be a recurring condition. Recent research has uncovered the potential of herbal remedies in treating this condition, while also highlighting the limitations of chemical drugs. However, the researchers noted that the analyzed studies showed heterogeneity in their design, materials, and methods, leading to varying levels of study quality. To expand our knowledge of the pharmacological activities of medicinal plants, future research should investigate their toxicity, bioavailability, and pharmacokinetics in humans, using both cell and animal models. It is important to note that to date; no human clinical trials have been conducted. Such research is essential in broadening the current medical applications of medicinal plants and raising public awareness of their potential benefits. By exploring the therapeutic potential of natural compounds. We may be able to develop more effective and sustainable treatments for dermatitis and other dermatological conditions.

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## Declaration of Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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