International Journal of Advance and Innovative Research
Volume 9, Issue 3 July - September 2022
ISSN 2394 - 7780

POTENTIAL IMPLICATION OF AYURVEDA FOR THE MANAGEMENT OF DERMATOLOGIC DISORDER: PSORIASIS

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ABSTRACT
An inflammatory T-cell immune-mediated condition known as Psoriasis, recognized by epidermal hyperplasia, proliferation of keratinocyte and has no known long-term treatment. Although there are several ways to cure psoriasis, no single medicine makes an acceptable and comprehensive claim. There are many well-established conventional medical treatments for psoriasis have also been reported, ranging from topical medicines and systemic treatments to phototherapy or combinations of those but the majority of these treatments are ineffective and have a variety of side effects that limit their long-term usage. Due to their safety and accessibility, ayurvedic or herbal medications may hold promise as possible anti-psoriatic molecules. There are numerous medicinal plants in nature that are used to heal skin conditions. In order to raise public awareness of the efficacy of some medicinal plants in the treatment of psoriasis, the purpose of this paper is to highlight the positive benefits of these plants. The plants selected have great medical potential; several of them have active phytochemical components and are referred to as anti-psoriatic herbs.

Keywords: Psoriasis, Inflammation reaction, Ayurveda herbs

INTRODUCTION
Psoriasis is a chronic autoimmune human skin disorder that causes excessive proliferation of keratinocytes, scaly plaques, severe inflammatory cell infiltration, erythema, and vascular modelling (Zhou et al., 2009). A wide range of conventional medical therapies to treat psoriasis is established, from topical therapies, systematic therapies to photo therapies and other biologic response modifiers. However, most of these therapies cause a number of side effects, limited in efficacy and short-term treatment of psoriasis causes its remission after finishing the treatment or only relieves the patient's condition. Therefore, the development of new alternative treatments for psoriasis causing fewer side effects would be desirable. Herbal medicines are greatly accepted by patients because they are believed to be safer than conventional therapeutics. Herbal drugs may become an effective treatment for psoriasis, causing lower costs and less side- or toxic effects in comparison to other therapies. Therefore, the goal of this review is to highlight the various ayurveda plants used for the management of psoriasis.

Psoriasis
Psoriasis is a chronic inflammatory skin disease with a strong genetic predisposition and autoimmune pathogenic traits. The word "psoriasis" is Greek in origin and means "roughly itching condition" (psora: "itch", sis: "action"). It occurs when skin cells suddenly rises from below the surface of the skin and pile up on the surface before they can mature. Generally this process (also called turnover) takes about a month, however in psoriasis it may occur in only a few days (Kumar, 2016).

There are five main types of psoriasis, namely; Plaque psoriasis, Guttate psoriasis, Inverse (Flexural) psoriasis, Pustular psoriasis and Erythrodermic psoriasis. Apart from these nail psoriasis is there, which is localized to the nails only and psoriatic arthritis is limited to joint and connective tissue inflammation. The main symptoms of psoriasis are irritation, red and flaky patches of skin. Patches are mostly appears on the elbows, knees and trunk of the body, but can appear on scalp and elsewhere in the body as shown in Fig 1. The skin may be itchy, dry and covered with raised thick silvery flaky skin pink red in color (Jobling et al., 2007). It is a chronic condition that affects individuals physically, intellectually, and socially and has unpredictable remissions.

ISSN 2394 - 7780

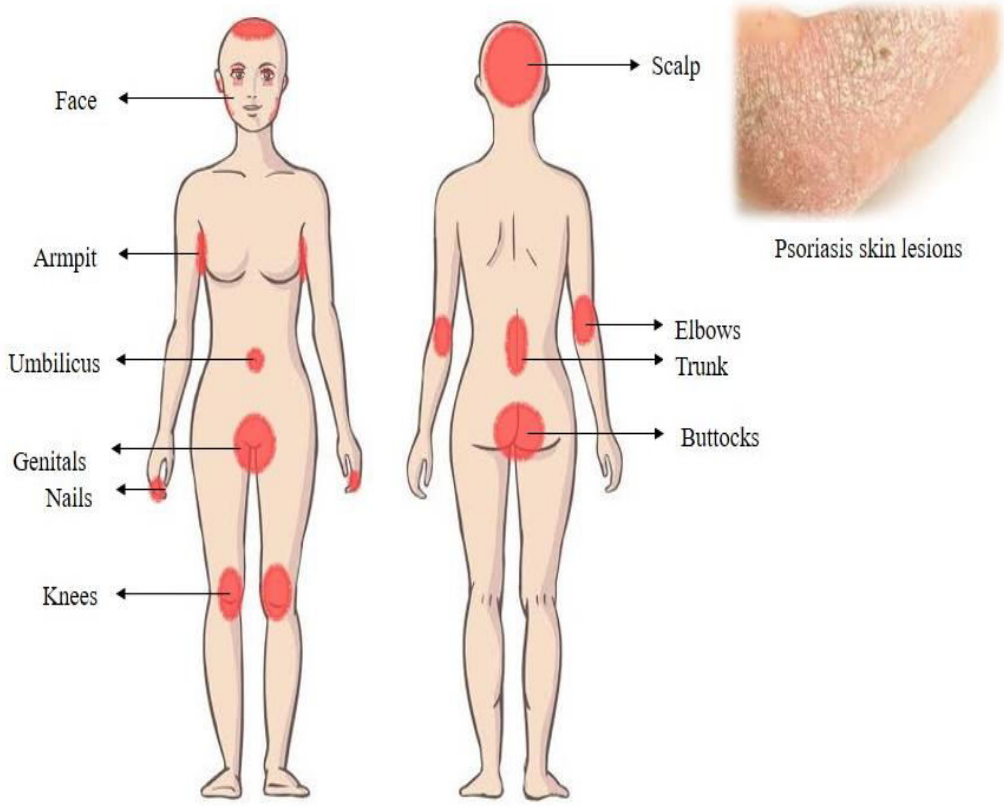

Figure 1: Common sites of psoriatic lesions

Pathophysiology of psoriasis

The multifactorial pathophysiology of psoriasis includes epidermal hyperproliferation, irregular epidermal keratinocyte differentiation, and inflammation with immunologic changes in the skin (Brian, 2007). Increased DNA synthesis and a significantly slower rate of epidermal turnover are features of the hyperproliferation. Two signals are required for cutaneous immune T-cell-mediated activation, which are transmitted between cells via surface proteins and antigen-presenting cells such dendritic cells or macrophages: First, there is the connection between the T-cell receptor and the antigen, and second, there is co-stimulation, which is mediated by numerous surface interactions. Studies of histocompatibility antigens illustrate associations with human leukocyte antigens (HLA) Cω6, TNF-α and IL-3 (Dipero, 2015). The pathophysiology of psoriasis as shown in Fig 2.

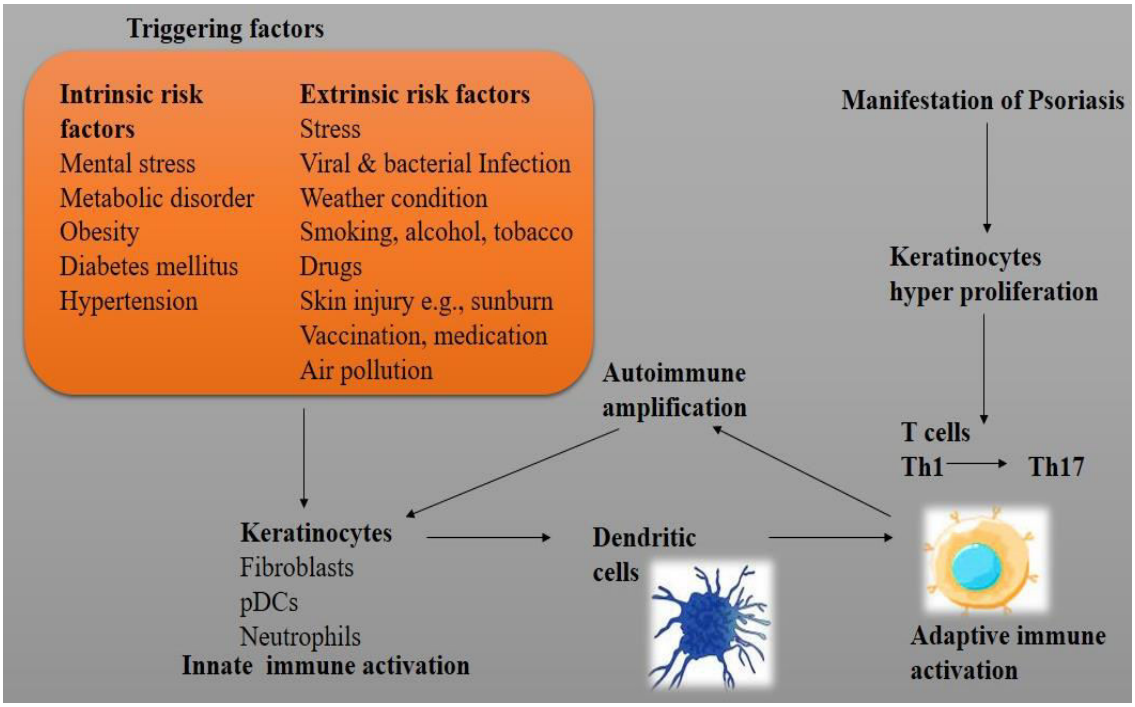

Figure 2: Pathophysiology of Psoriasis

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Epidemiology

The epidemiology of psoriasis is well defined, and there has been substantial research on the prevalence of the condition, the severity of its symptoms, and healthcare costs. Over 125 million people (2.2% of the population) worldwide suffer with psoriasis has been identified by psoriasis according to the World psoriasis day consortium. Although the frequency varies by geographical region, rich nation's house 4.6% of the world's population have been reported to have higher rates.

Regionally, the occurrence of the disease for the overall population varied from 0.11% in East Asia to 1.58% in Australasia, and 1.52% in Western Europe. Considering the estimate for the overall population, Australia (1.88%, 0.59% to 6.10%), Norway (1.86%, 0.94% to 3.97%), Israel (1.81%, 0.83% to 4.44%), and Denmark (1.79%, 0.91% to 3.61%) had the highest estimates of the prevalence of psoriasis (Parisi et al., 2020). Psoriasis can occur at any age; however a study has reported 33 years as the onset age for psoriasis, whereas 75% of the cases developed before 46 years of age, according to WHO global report.

Ayurveda

Ayurveda is a Sanskrit word originated from "Ayus" meaning life and "Veda" meaning knowledge or science. Hence the term Ayurveda means "The knowledge of Life. The use of Ayurvedic medicines have been increasing for skin diseases. Studies have been conducted to understand the view point of dermatologists concerning the effect of Ayurvedic therapy for psoriasis. They perceived that the impact of the Indian culture and the need for an improved outcome were the primary reasons for the use of Ayurvedic medicines by the patients (Kulkarni, 2018).

Ayurvedic Treatment for Psoriasis

There are numerous established conventional medical treatments for psoriasis, including topical treatments like corticosteroids, tazarotene, vit D3 analogue, anthralins (dithranol), tacrolimus, fumaric acid esters, salicylates, systemic treatments like methotrexate, cyclosporine, and acitretin, as well as phototherapy like ultraviolet (UV) light, Ultraviolet B (UVB) phototherapy, Psoralen and ultraviolet a phototherapy (PUVA) and new biologic agents like Adalimumab, Etanercept, Infl iximab, Alefacept, and many more are available in the market but due to their adverse side-effects, the majority of these medicines are restricting their long-term usage. A number of side effects these synthetic drugs can causes such as acne, contact dermatitis, burning, stinging, stains skin, erythema or adverse effects include dryness of the eyes, cheilitis, brittle nails, epistaxis, xereosis, hyperkalemia, hypertension, hypertriglyceridemia, hepatic and pulmonary toxicity. Therefore, ayurvedic natural medicines have attracted much attention as alternative medicines. The natural medicines are safer, more effective, less side- or toxic effects and play a very important role in the management of the skin and inflammatory diseases. The list of various ayurvedic plants used in the treatment of psoriasis are shown in Table 1.

Table 1. Ayurvedic plants used in the psoriasis

Sl. No.	Scientific Name	Family Name	Common Name/ Local Name	Parts Used
1.	Aloe vera	Liliaceae Aloes	Kathalai	Leaf
2.	Calendula officinalis	Compositae	Marigold, ThulukkaSaamanthi	Flowers
3.	Curcuma longa L.	Zingiberaceae	Turmeric, Manjal	Rhizome
4.	Capsicum annum	Solaneceae	Cayenne, Milagai	Leaves
5.	AzadirachtaindicaA. Juss.A. Juss.	Meliaceae	Neem, Veppam	Leaves, bark and stemstem
6.	Silybum marianum	Asteraceae	Milk thistle	Seeds
7.	Smilax china	Smilacaceae	China Root	Rhizome
8.	Nigella sativa	Ranunculaceae	Black cumin, Karunjiragam	Seeds
9.	Origanum jordanicum	Lamiaceace	Thyme	Leaves
10.	Indigo naturalis	Acanthaceae	Qing dai, indigo	Leaves
11.	Mahonia aquifolium	Berberidaceae	Oregon grape	Fruits
12.	Olea europaea	Oleaceae	Olive	Fruits oil
13.	Persea americana	Lauraceae	Avocado	Fruits
14.	Alpiniagalanga	Zingiberaceae	Thai Ginger, akkulati	Rhizome
15.	WrightiatinctoriaL.	Apocynaceae	Sweet Indrajao, Paalai	Leaves

ISSN 2394 - 7780

Aloe Vera

Aloe Vera is an effective treatment for psoriasis because the active ingredients have demonstrated significant properties such as antipruritic, analgesic, anti-inflammatory, and wound healing capabilities. Nearly all patients in the aloe group had much higher rates of eliminating their psoriatic plaques due to their grease-free penetrant that is easily absorbed deeper into the tissues. The occlusive effect of aloe vera extract, helps to keep the skin moisturized while also directly limiting the development of psoriatic plaques by reducing cell proliferation and stimulatory differentiation in the epidermis (Syed et al., 1996). The primary active ingredients in aloe vera are anthraquinone and acemannan that exhibit antibacterial activity against Staphylococcus and Streptococcus species which contributes to its effective therapeutic treatment as anti-psoriatic activity (Singh et al., 2014).

Calendula Officinalis

Calendula officinalis, a member of the Compositae family, is one of the most widely used Indian herbs with a variety of therapeutic benefits for the treatment of many diseases, including antifungal, wound-healing, and anti-diabetic compounds, respectively. Calendula oil is useful in providing soothing properties and the treatment of injured skin, or for conditions or such as irritative and allergic contact dermatitis, vitiligo, rosacea, melasma, psoriasis and cutaneous toxicities derived from cancer treatment (Silvaet al., 2021).

Curcuma Longa L

Curcuminoids and volatile oils are thought to include anti-inflammatory compounds that work by specifically inhibiting phosphorylase kinase (PhK). The epidermis contains the enzyme PhK.

Significantly greater levels have been found to be associated with psoriasis clinical activity. The degree of parakeratosis, changes in keratinocyte transferrin receptor expression, and densities of epidermal CD8 + T cells were all shown to correlate with lower PhK activity in the curcumin and calcipotriol treated groups (Joe et al., 1997). HaCaT cells have demonstrated that it can suppress the expression of IL-17, IL-6, TNF-α, and IFN-γ.

Capsicum Annum

Its primary active component is capsaicin, depletes the vanilloid receptor by attaching to it and releasing substance-P. Additionally, it results in substance-P (SP) activity being less active, which affects a number of psoriasis-related processes like the activation of inflammatory cells, keratinocyte hyperproliferation, vasodilation, and angiogenesis. It showed high skin permeation through the hyper-proliferative skin ((Joe et al., 1997). Additionally, increased patient compliance would result in improved deposition at the skin's target region, which would be extremely advantageous and more effective (Agrawal et al., 2015).

Azadirachta Indica A. (Neem)

Organic neem oil has also been used to treat other skin conditions like eczema, psoriasis, acne warts, and mycosis. Neem oil and leaves have been used by Indian Siddha medicine to treat skin conditions, primarily psoriasis, since ancient times. Interestingly, A. indica is high in nimbidin (Nimbolide phytochemical), a recent study suggested using it as a dietary treatment for psoriasis. In an RCT (randomised controlled trial) of 50 patients, three capsules of A. indica were taken daily for 12 weeks, and the PASI (psoriasis area and severity index) score significantly decreased. The reason may be speculate by authors is due to the inhibition of prostaglandin synthetase by nimbidin, which is a secondary metabolite found in the A. indica essential oil (Baby et al., 2022).

Milk Thistle

Silibum marianum commonly known as Milk thistle or vishnukranti, proposed by practitioners of alternative medicine to boost the liver's production of bile and to control the immunological system. This herb is a potent treatment for psoriasis because it protects the liver and keeps the blood clean & healthy. This plant is very well known for its hepatoprotective activity. In psoriatic patients, abnormally high levels of cAMP and leukotrienes have been developed. To normalization of these levels, silymarin plays important role in the management of psoriasis due to its ability to improve endotoxin removal by the liver, suppress cAMP phosphodiesterase and leukotriene synthesis (Sabir et al., 2014).

Smilax China

S. china L. known as Jin Gang Ten, has been widely used as a traditional herbal medicine for the treatment of rheumatism, diabetes, gout, skin diseases, psoriasis, obesity, chronic nervous diseases, epilepsy, and other diseases. Smilax china possesses antibacterial, antimutagenic, antioxidant, anti-inflammatory, anti-cancer, and neuroprotective properties. Vijayalakhsmi et al., 2012 reported Smilax China's anti-psoriatic properties. They separated the flavonoid quercetin from the rhizome's methanolic extract. They performed anti-psoriatic effect on HaCaT cell lines showed significant ($p<0.01$). They reported a considerable reduction in leucocyte migration and epidermal thickness. It was the first time flavonoid quercetin's anti-psoriatic properties had been reported.

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Nigella Sativa
The in-vitro anti-psoriatic activity of Nigella sativa seeds has been demonstrated in HaCaT human keratinocyte cell lines by using Sulphorhodamine B (SRB) assay. The epidermal layer's thickness increased and epidermal differentiation occurred at significant levels ($p<0.05$) in response to a 95% ethanolic extract of Nigella sativa seeds (commonly known as Black cumin), as comparable to the impact of tazarotene (0.1%) gel (positive standard control) which supported its use as an anti-psoriatic medication (Dwarampudi et al., 2012).

Thymus Vulgaris
Thymus vulgaris, a member of the Lamiaceae family of flowering plants, is more generally known as thyme. Thymus vulgaris is used for skin problems such as oily skin, psoriasis, acne, dermatitis, eczema, and insect bites. Thyme contains a natural flavonoid called apigenin. Antibacterial, anti-inflammatory, and antioxidant activities are all present in this flavonoid. The plant flavone apigenin, is non-mutagenic, is a potent inhibitor of NF-B activation in autoimmune cells. The in-vivo study was conducted that showed the IL-6 and IL-12 levels decreased after apigenin stimulation in mice. These cytokines are present in significant amounts in psoriasis, thus this plant act as anti-psoriatic drug (Nowak-Perlak, et al., 2022).

Mahonia Aquifolium
M. aquifolium plant used widely to treat skin conditions, particularly psoriatic plaques. The plant is a member of the Berberidaceae family, and its bark extract contains the compounds berberine, berbamine, and oxyacanthine, which inhibit 5-lipoxygenase and lipid peroxidation, respectively. Thus, it have an anti-inflammatory effects and inhibits the keratinocytes growth (Muller et al., 1994). Gulliver et al. reported that after a month of treatment on psoriasis patients, this plant showed significantly improvement in both PASI (Psoriasis area severity index) score and dermatology life quality index.

Olive Oil
Olive oil is an effective treatment for mild cases of plaque psoriasis. To lessen dryness and irritation and to speed up healing, it can be massaged directly into the skin's affected regions. Olive oil is stated to have antioxidant characteristics (vitamin E), which will be of use in the case of psoriasis, since free radicals have been associated with psoriasis outbreaks. It is anticipated that more patient compliance and decreased systemic toxicity will result from topical application because of its superior anti-psoriatic activity and decreased serum accumulation (Rashid et al., 2021). In vivo antipsoriatic studies revealed the greater reduction in PASI score and the remission of psoriasis-like symptoms.

Persea Americana (Avocado)
Avocado oil is extracted from the plant i.e. used in the management of psoriasis. Numerous components, including polyunsaturated fatty acids (PUFAs), monounsaturated fatty acids, linolenic acids, and linoleic acids, are present in the oil (De Oliveira et al., 2013).They possess an anti-inflammatory effect by a catabolic activity on collagen that can scavenge the free radicals that cause cytotoxicity. It may result in a decrease in the quantity of fibroblast and inflammatory cells. In a randomized prospective clinical trial with the substance, Stucker et al., (2001) found that patients' tolerability and the PASI score both significantly improved.

Alpiniagalanga (Thai Ginger)
Chanachai et al (2009) reported that these plants have anti-psoriatic effects such as Alpinia galanga, Curcuma longa, and Annona squamosa. They described how the extracts controlled NF-kB signaling biomarkers to suppress psoriasis on a molecular level. They reported gene assay in ten different NF-kB signaling network genes in HaCaT cells using semi-quantitative RT-PCR. The studies reported on HaCaT cell lines demonstrated effective NF-B regulation, which resulted in decreased expression of CSF-1 and NF-B2 and increased expression of TNFAIP3 (Saelee et al., 2011).

Wrightiatinctoria
Wrightia tinctoria hydroalcoholic leaves extract reportedly had a strong antipsoriatic impact on a mouse test model when compared to isoretinoic acid as the reference standard. Dhanabal et al., (2012) discovered that the extract significantly increased orthokeratosis and had strong antioxidant activity in tests for DPPH, nitric oxide, and hydrogen peroxide.

CONCLUSION
An intricate, multifaceted inflammatory skin condition called psoriasis is characterized by localized vascular alterations, aberrant keratinocyte growth, and neutrophil activation. The synthetic medications used to treat it have negative effects, and it has been observed that some of them can cause psoriasis. Skin conditions like psoriasis are increasingly being treated using herbal products. Some of them, which can be used to effectively treat psoriasis, specifically block epidermal hyperplasia and/or inflammation. In this article, a number of plant

ISSN 2394 - 7780

sources have been highlighted using both traditional wisdom and research reports. However, to make the ayurvedic treatment more effective, potential herbal drug delivery system is required. The majority of antipsoriatic medications have been successfully transported by nanodrug carriers like liposomes, ethosomes, niosomes, lipid nanoparticles, metallic nanoparticles and others, and these carriers have the potential to enhance these medications' therapeutic potential. By reducing overall dose, localising the drug, and targeting it specifically, nanomedicines as drug carriers offer a stunning effect that includes improved therapeutic efficacy with decreased toxicity.

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