

A Review on Medicinal Plants Used in Certain Skin Diseases in Sri Lanka

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Abstract

This article aims to review the therapeutic potential, chemistry, and botanical aspects of certain medicinal plants used in indigenous medicine in Sri Lanka for treating skin diseases. Medicinal plants have been utilized for generations across various cultures, including Sri Lanka, reflecting a rich body of empirical knowledge regarding their efficacy and safety. Examining these traditional practices can provide valuable insights into potential new therapeutic agents and treatment approaches for skin diseases. This review article focuses on explaining the traditional medicinal usage of 15 medicinal plants, *Curcuma longa* L., *Azadirachta indica* (A.Juss), *Coscinium fenestratum* (Gaertn.) Colebr., *Hemidesmus indicus* (R.Br.), *Ricinus communis* L., *Mimosa pudica* L., *Moringa oleifera* Lam., *Ixora coccinea* L., *Atalantia ceylanica* (Arn.) Oliv., *Murraya koenigii* L., *Aloe vera* L. Burm., *Cassia fistula* L., *Carica papaya* L., *Cocos nucifera* L., and *Elaeocarpus serratus* L. The review article is based on a literature review of selected studies published between 1990 to 2024. The databases used included PubMed and Google Scholar. The keywords used in the search included “medicinal plants [name of the plant] + skin diseases + Srilanka”, “[name of the plant] + phytochemicals”, “[name of the plant] + clinical studies + skin diseases” and “[name of the plant] + botany”.

Key words: Indigenous medicine, Medicinal plants, Phytochemicals, Skin diseases, Sri Lanka

1. Introduction

Medicinal plants are vital in traditional medical systems worldwide, including Sri Lanka, where they have been primary remedies for various ailments for centuries. These plants are deeply connected to cultural beliefs and practices passed down through generations via oral traditions, and offer a natural, holistic approach to healing. Exploring traditional medicinal plants for treating skin diseases is particularly important due to the extensive empirical knowledge about their efficacy and safety, their accessibility and affordability, and their holistic approach that addresses not only physical symptoms but also underlying causes. This exploration promotes biodiversity conservation and the preservation of traditional knowledge. Collaboration between traditional healers, scientists, and healthcare professionals can enhance knowledge exchange and innovation, leading to the development of evidence-based treatments that integrate traditional and modern medicine. The purpose of this review is to examine medicinal plants used in treating skin diseases in Sri Lanka, focusing on their traditional uses and pharmacological activities.

2. Medicinal plants used in treating skin diseases in Sri Lanka

Skin diseases in Sri Lanka pose a significant health burden, affecting individuals across all ages and socioeconomic backgrounds. The tropical climate, poor hygiene, inadequate sanitation, and limited access to healthcare in certain regions contribute to the high prevalence of conditions such as fungal infections (e.g., dermatophytosis), bacterial infections (e.g., impetigo, cellulitis), parasitic infestations (e.g., scabies), and inflammatory conditions (e.g., eczema, psoriasis) [1], [2]. These conditions often result in significant psychosocial impacts, including social stigma, depression, and decreased quality of life. Environmental factors like UV radiation and chemical pollutants can worsen these ailments. Understanding the epidemiology and burden of skin diseases is crucial for developing effective prevention strategies and improving dermatological care [1]. Traditional medicine addresses 60–70% of the primary healthcare needs of Sri Lanka's rural population. The country boasts 1,430 medicinal plant species, with 174 endemic species [3]. Of these, 250 species are commonly used in traditional medicine, with 50 being particularly prevalent [4]. Recent research suggests that Sri Lankan medicinal plants have potential as natural skincare solutions due to their high UV absorption and potent antioxidant activities, offering prospects for developing herbal cosmetics [5]. Studies have explored the potential of several plant species for photoprotective cosmetic products and for treating skin disorders such as hyperpigmentation and aging-

related issues, highlighting their antioxidant and enzyme inhibitory activities [5], [6]. This review focuses on fifteen Sri Lankan plants with significant potential for skincare treatments, leveraging bioactive compounds and traditional knowledge for developing effective therapies for skin diseases (Table 1). The inclusion criteria for selecting these plants are based on their traditional usage, availability and therapeutic efficacy.

2.1 *Curcuma longa*

Turmeric, scientifically known as *Curcuma longa* L. (Zingiberaceae), is an herbaceous perennial native to South and Southeast Asia, thriving in tropical and subtropical climates. It is characterized by dark green leaves, a fleshy orange rhizome with a spicy smell, and can grow up to 1 meter tall. It holds cultural significance in Asian cuisine and traditional medicine, with its rhizome containing curcumin, a compound known for its yellow-orange color and medicinal properties, including anti-cancer and antibacterial effects [7]. *C. longa* ('Kaha') is commonly used in treating skin diseases, fungal infections, pimples, and for other skin enhancement treatments. For skin diseases, a mixture of turmeric and neem (*Azadirachta indica*) leaves is boiled, and the water extract is used to wash infected areas. Ground raw turmeric and *Aththora* (*Cassia alata*) paste is applied for fungal infections, and a mixture of ground turmeric with undupiyaliya (*Desmodium triflorum*) is used for pimples [8]. Turmeric is frequently used in commercialized herbal cosmetic products, with a frequency index of 54.55 for manufacturing skin care products [9]. The rhizome paste is applied to prurigo, urticaria, boils, and bruises [10].

Major secondary metabolites in *C. longa* include bisdemethoxycurcumin, demethoxycurcumin, curcumin, curcuminoids, and the mono- and sesquiterpenes zingiberene, aromatic turmerone (ar-turmerone), and α - and β -turmerone [11]. Curcumin has shown potential as a topical treatment for psoriasis by inhibiting PhK activity [12]. Animal studies confirmed curcumin's effects against melanoma, particularly when delivered via formulations that enhance bioavailability, such as nanocapsules. Curcumin, alone or combined with phototherapy, is promising in treating bacterial and fungal skin diseases, addressing multi-drug resistance [13]. The anti-aging activity of *C. longa* was demonstrated through UVB-induced skin aging assays, which showed reduced epidermal thickness and inhibited expression of interleukin-1 β and tumor necrosis factor- α [14].

2.2 *Azadirachta indica*

Azadirachta indica (Meliaceae), commonly known as 'Kohomba' is a versatile tree highly valued for its diverse applications, including food, insecticides, and ethnomedicine. The bark is grey and often exudes a sticky, foul-smelling sap in humid climates. *A. indica* leaves are arranged alternately, dark green, and glossy, typically 20-40 cm long with 10-20 sickle-shaped leaflets. Fragrant white flowers bloom in large

clusters, and the fruit is a smooth, green drupe that matures to yellow-brown, containing ovoid oil seeds [15], [16], [17].

In Sri Lanka, the juice of *A. indica* leaves is used with rock salt for intestinal worms and with honey for jaundice and skin diseases. The tree sap is recommended for chronic cases of leprosy and other skin diseases [10]. *A. indica* is rich in various phytoconstituents, with azadirachtin being the most significant. Other constituents include nimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinat, gedunin, salannin, and quercetin. Leaves contain compounds like nimbin, nimbanene, 6-desacetylnimbinene, nimbandiol, nimbolide, ascorbic acid, n-hexacosanol, amino acids, 7-desacetyl-7-benzoylazadiradione, 7-desacetyl benzoylgedunin, w17-hydroxyazadiradione, and nimbiol. Polyphenolic flavonoids such as quercetin and β -sitosterol have antibacterial and antifungal properties, while seeds contain valuable constituents like gedunin and azadirachtin [18].

An herbal neem soap is made by blending 36.4% palm oil, 9.1% coconut oil, 27.3% sodium hydroxide, 9.1% neem oil extract, and 18.2% neem aqueous extract, forming a pale-yellow soap base suitable for human skin and a therapeutic alternative for skin problems [19]. Studies on *A. indica* revealed the minimum fungicidal concentration (MFC) and the minimum inhibitory concentration (MIC) for leaf and seed extracts against dermatophytes like *Trichophyton mentagrophytes*, *T. rubrum*, and *Microsporum nanum*. The minimum inhibitory concentration (MIC) of neem seed extracts was found to be 31 μ g/mL for all the dermatophytes tested. Interestingly, even when the neem seed extract was used at a lower concentration of 15 μ g/mL (below the MIC), it was still effective in disrupting the growth pattern of the organisms tested. [20]. Compounds from *A. indica* and *A. indica* var. *siamensis* have shown inhibitory activity against melanogenesis in B16 4A5 (mouse melanoma cells) stimulated with or without α -melanocyte-stimulating hormone (α -MSH). Some compounds (4 azadiradione-type limonoids, 5 nimbin-type limonoids, and 2 salannin-type limonoids) showed higher melanogenesis inhibition (79.1–108.1% cell viability) than the reference arbutin (100.1% cell viability), used in skin whitening for the cosmetic sector [21].

2.3 *Coscinium fenestratum*

Coscinium fenestratum ('Weni wel') belongs to family Menispermaceae is a large woody climber with yellow bark, cor32ky often densely covered in fine hairs, sometimes bearing slender tendrillar branchlets. Leaves are simple, alternate, and leaf blades are thick, broadly ovate, with acute or acuminate tips [22].

The product of this plant in Sri Lanka is used as a healing agent for numerous conditions including ophthalmopathy, inflammation, ulcers, skin disease, abdominal disorders, jaundice, fever, and general debility [23]. An infusion, distillate and concentrated liquor are also prepared to wash wounds and skin rashes. The root bark is used for dressing wounds, ulcers and in cutaneous leishmaniasis [24]. *C. fenestratum* holds important alkaloid containing

phytoconstituents like berberine, dihydroberberine, noroxyhydrastine, berberine, cerylalcohol, saponin, hentriacontane, sitosterol glucoside, palmitic acid, oleic acid etc. were isolated from the stem and roots [25]. Berberine alkaloidal fraction of *C. fenestratum* stem showed strong anti-acne activity [22] and it showed maximum anti-acne activity and the “Minimum Bactericidal Concentration” against both *Propionibacterium acnes*, and *Staphylococcus epidermidis*. Thus, berberine could be of interest for further development as an alternative treatment for acne.

2.4 *Hemidesmus indicus*

Hemidesmus indicus (L.) R. Br., commonly known as ‘Iramasu’ in Sri Lanka. This species belong to family Apocynaceae, and is a wild plant properties. This perennial plant exhibits semi-shrubby characteristics with a woody rootstock. Its stem is lengthy, either prostrate or ascending, and tends to slightly twine. The leaves are simple, opposite, and vary in shape from oblong-oval to linear. Flowers are regular and bisexual, adorned with numerous bracts [26], [10].

In Sri Lankan folk medicine, the root is used in the treatment of fever, carbuncles, fistulas, urinary diseases, blood and skin diseases, syphilis, and acute rheumatism [27]. The root bark is a purgative and it is also effective in skin diseases, burns and sores.

Different phytochemicals were found in the presence of steroids, terpenoids, flavonoids, coumarins, aldehydes, pregnane glycosides, and others. The root oil constituents were found to be rich in terpenoids, aldehyde, and aliphatic acids. The roots extract of *H. indicus* showed strong inhibitory effect on *Propionibacterium acne* and *Staphylococcus epidermidis*. Minimum inhibitory concentration for *P. acne* and *S. epidermidis* was found to be 0.051 mg/ml and 1.25 mg/ml. Terpenoidal fraction found during sequential extraction of *H. indicus* showed potent anti-acne activity and minimum inhibitory concentration determined by broth dilution assay was found to be 38 ug/ml for both *P. acne* and *S. epidermidis* and minimum bactericidal concentrations were 38 ug/ml and 46 ug/ml, respectively [28].

2.5 *Ricinus communis*

Ricinus communis (L.), commonly known as ‘Beheth Endaru’ in Sri Lanka belongs to family Euphorbiaceae, is a shrubby or tree-like plant species. The tree typically grows erect and leaves are roughly circular in outline. The inflorescence bears both male and female flowers and the fruit is smooth-surfaced, seeds are shiny and greyish, beige, or silvery in color [29].

In Sri Lankan traditional medicine, roots and leaves of the plant are given for lumbago, sciatica, pleurodynia and skin diseases [30]. Also, root bark is found to be purgative and used as a remedy for skin diseases, burns and sores [8]. Rutin, gentistic acid, quercetin, and gallic acid are determined in the dried leaves of *R. communis* L. Seeds contain three toxic proteins Ricin A, B and C and one ricinus agglutinin and indole-3- acetic acid has been extracted from the roots. The

pericarp of the fruits of *R. communis* contains alkaloid, ricinine [31]. Seed oil of *R. communis* L. is applied in eczema and other skin ailments [32] and the results of a systematic review and histological analysis show that the time of skin wound healing in the group that was treated with castor leaf extract was shorter than the nontreated group [33]. Also, *R. Communis* (Castor) seed oil functions as a fragrance ingredient and a skin-conditioning agent, occlusive in cosmetic products, and Hydrogenated Castor Oil functions as a skin-conditioning agent, occlusive and a viscosity increasing agent [34].

2.6 *Mimosa pudica*

Mimosa pudica (L.), commonly known as ‘Nidikumba’ in Sri Lanka, belongs to the Fabaceae family and is a semi-prostrate herb, typically growing up to 0.5 meters in height. The stems are covered with long, weak bristles and the leaves are digitate compound with one or two pairs of sessile, hairy pinnae [35]. *M. pudica* is commonly used for bleeding disorders like menorrhagia, dysentery with blood, mucus, and piles, and it is also incorporated into remedies for curing skin diseases and poisons [8, 36].

Phytochemical studies on *M. pudica* have identified several bioactive compounds, including alkaloids, fatty acids, flavonoids, sterols, terpenoids, and tannins. Notably, mimosine, a non-protein amino acid, is found in abundance in the plant [37]. Additionally, the seed extract of *M. pudica* has been shown to possess strong antioxidant and anti-tyrosinase potential due to its polyphenolic compounds [38]. Furthermore, topical emulgel formulations containing *M. pudica* seed extract have demonstrated significant positive effects on various dermatoheliotic-related skin parameters such as erythema, melanin, elasticity, hydration, and sebum. [39]. Moreover, *M. pudica* extracts exhibit promising antibacterial activity against pathogens commonly associated with skin conditions. The Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of *M. pudica* extracts against bacteria like *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Cutibacterium acnes* indicate their potential as a source of antibacterial agent for the development of anti-acne cosmetic products [39].

2.7 *Moringa oleifera*

Moringa oleifera (‘Murunga’), a member of the Moringaceae family, is a rapidly growing deciduous tree native to the sub-Himalayan regions of Northern India [40]. The leaves, notable for their high protein content, minerals, β -carotene, and antioxidant compounds, are used in nutrition and traditional medicine [41]. Almost all parts of the plant root, bark, gum, leaf, fruit (pods), flowers, seeds, and seed oil are used to treat various diseases, such as skin infections, swelling, anemias, asthma, bronchitis, diarrhea, headache, joint pain, rheumatism, gout, heart problems, fevers, digestive disorders, and wounds [42]. Additionally, the root, bark, leaf, flower, seed, and gum are used for enlarged spleen and liver, rheumatism, fever, epilepsy, mouth sores, and leprosy [10]. The seeds, roots, bark, and leaves are also used for eye

diseases, paralysis, osteoarthritis, worm diseases, skin diseases, and snake bites [43].

A GC/MS study of *M. oleifera* leaf extracts using various solvents identified six common compounds: phytol, vitamin E, hexadecanoic acid, 2,6,10-trimethyl, 14-ethylene-14-pentadecene, hexadecanoic acid, trimethylsilyl ester, and 3,7,11,15-tetramethyl-2-hexadecen-1-ol [44]. The main phenolic compounds in Moringa leaves include flavonoids (apigenin, quercetin, luteolin, myricetin, kaempferol), lignans (secoisolariciresinol, isolariciresinol, medioresinol, epipinoresinol glycosides), and phenolcarboxylic acids and derivatives (coumaroylquinic, caffeoylquinic, feruloylquinic acids) [44]. A seed oil cream developed from *M. oleifera* demonstrated antioxidant activity, enhanced skin hydration, and reduced skin erythema without affecting melanin content or causing skin irritation, proving safe for use [45]. *M. oleifera* leaf extracts also showed significant anti-aging properties, with anti-elastase, anti-collagenase, and anti-hyaluronidase activities, making them promising for skincare applications in the cosmetics and cosmeceutical industries [46]. These findings suggest that *M. oleifera* leaves are a potential natural source of anti-aging agents for combating skin aging and wrinkling.

2.8 *Ixora coccinea*

Ixora coccinea Linn, known as 'Rathmal' (Rubiaceae) in Sri Lanka, is a common flowering shrub indigenous to Southern India, Bangladesh, and Sri Lanka. *I. coccinea* is used as barriers, screens, house-hugging plants, massed in flowering beds, or grown as shrubs or small trees [47]. In traditional medicine, a decoction of the roots is used for dysentery, hiccoughs, nausea, and loss of appetite, fever, and gonorrhoea. The flowers and bark are applied to reddened eyes and skin eruptions in children, while a flower decoction is given for hemoptysis, bronchitis, and dysmenorrhoea. The leaves treat dermatological disorders in Sri Lanka [48]. Additionally, the plant's flowers, bark, and leaves are used for skin diseases, eye diseases, leucorrhoea, and candida infections [43]. In South Asia, *I. coccinea* treats infections, hypertension, menstrual irregularities, sprains, chronic ulcers, and cutaneous wounds [10]. Phytoconstituent screening of the flower extract revealed total phenolics, flavonoids, and anthocyanin contents of 128 mg, 20.63 mg, and 30 mg/100 g, respectively. HPLC characterization identified sinapic acid (21.96 mg) and myricetin (0.13 mg) as the main phenolics [49]. The essential oil, obtained by hydrodistillation and analyzed by gas chromatography, comprises triterpenes, monoterpenes, sesquiterpenes, and an ester. Ursolic acid, oleanolic acid, and lupeol are the major triterpenes. Geranyl acetate, linalyl acetate, neryl acetate, α -terpineol acetate are monoterpenes, and borneol acetate and ethyl cinnamate are esters, while cyperene and α -copaene are sesquiterpenes [50]. The methanolic extract of *I. coccinea* roots showed similar antioxidant activity to standard ascorbic acid and exhibited strong tyrosinase inhibition with an IC₅₀ value of 120.03 μ g/ml using kojic acid as a reference. The extract demonstrated

superior skin whitening and antioxidant activities, suggesting its potential as a natural ingredient for cosmetic products [51].

2.9 *Atalantia ceylanica*

Atalantia ceylanica (Rutaceae), commonly known as 'Yakinaran,' is a densely branched shrub reaching up to 2.5 meters. The leaves, ranging from 3-7.6 cm long, are lanceolate, oval-oblong, or somewhat ovate. Flowers are about 13 mm in diameter, borne on slender, glabrous pedicels, and often clustered in short, pubescent corymbose or racemose cymes shorter than the leaves. This plant is primarily found in Sri Lanka and Southern India [52].

In Sri Lanka, it is used to treat catarrh, asthma, rheumatism, skin diseases and respiratory disorders, and to alleviate bee and wasp stings [53]. The leaves, when boiled with ghee, serve as a remedy for itchy skin diseases [54]. Two new isomeric aldoximes, ataloxime A and ataloxime B, were isolated from the seeds of *A. ceylanica* [55]. Research on the photoprotective activity of leaf extracts from *A. ceylanica* and *Hibiscus furcatus* led to the formulation of a sunscreen gel. This gel revealed a stable SPF value of 27.31, close to the reference product's 31.45, and remained stable over 90 days at room temperature [56]. The study concluded that the gel formulation with 1 mg/mL extract demonstrated excellent photoprotective activity, physicochemical properties, and stability.

2.10 *Murraya koenigii*

Murraya koenigii (Linn.) a member of the Rutaceae family, is commonly known as 'Karapinchā' in Sinhala, and is highly favored as a spice and condiment across Asia. Its leaves, whether fresh or dried, boast a distinct flavor and aroma, making them a popular addition to various dishes and gravies [57]. Leaves of *M. koenigii* are used in fresh, dry, paste, or oil form in skin and hair care remedies and its' oil is a very popular hair growth-promoting oil among Sri Lankans [10], [58].

Chemical characterization through GC-MS/MS showed that the main chemical compounds within curry leaf were caryophyllene, α -guaiene and α -phellandrene [59]. *M. koenigii* was found to be rich in flavonoids such as quercetin, rutin and phenols such as gallic acid, cinnamic acid and coumaric acid [60]. The phytoconstituents isolated so far from the leaves are alkaloids viz., mahanine, koenine, koenigine, koenidine, girinimbiol, girinimibine, koenimbine, O-methyl murrayamine A, O-methyl mahanine, isomahanine, bismahanine, bispyrayafoline and other phytoconstituents such as coumarin glycoside viz., scopotin, murrayanine, calcium, phosphorus, iron, thiamine, riboflavin, niacin, vitamin C, carotene and oxalic acid. The essential oil from leaves yielded di- α -phellandrene, D-sabinene, D- α -pinene, dipentene, D- α -terpinol and caryophyllene [61]. Research in 2020 highlights its significant role in promoting wound healing, attributed to enhanced wound contraction and collagen synthesis [62]. Additionally, *M. koenigii* is rich in bioactive compounds which possess antioxidant, anti-inflammatory, and antimicrobial properties. These properties

make it a promising candidate for addressing skin disorders such as hyperpigmentation, inflammation, and microbial infections.

2.11 *Aloe vera*

Aloe vera (L.) Burm, from the family Asphodelaceae (formerly Liliaceae), is a perennial succulent. It is characterized by triangular fleshy leaves with serrated edges, yellow tubular flowers, and fruit containing numerous seeds. Each leaf comprises three layers: an inner clear gel rich in water, glucomannans, amino acids, lipids, sterols, and vitamins; a bitter yellow latex sap containing anthraquinones and glycosides; and an outer thick protective layer synthesizing carbohydrates and proteins. *A. vera* is renowned for its versatility in skincare, health supplements, and traditional medicine, attributed to its nutrient-rich composition and potential therapeutic properties [63]. The inner gel of *A. vera* leaves is widely used as a remedy for skin burns, sunburns, pimples, and as a natural moisturizer for dehydrated skin. Additionally, it is applied to prevent hair loss and promote hair growth [10]. *A. vera* is rich in secondary metabolites such as anthraquinones (e.g., aloin, emodin), polysaccharides (e.g., acemannan), and vitamins (A, C, E, B12), along with minerals and plant steroids [64]. Topical application of *A. vera* extract has been extensively studied in various dermatological conditions, yielding mixed results in terms of efficacy. While ineffective in preventing radiation-induced injuries, it has shown promise in treating genital herpes, psoriasis, wound healing, and inflammation [65], [66]. A study demonstrated significant improvement in psoriatic plaques with topical *A. vera* extract cream compared to placebo, suggesting its potential as an alternative treatment for psoriasis [67]. *A. vera* extract contains bioactive compounds like acids, amino acids, enzymes, phenolics, polysaccharides, and vitamins, contributing to its therapeutic properties [68].

However, the clinical effectiveness of oral and topical *A. vera* requires further exploration through rigorous clinical trials to establish its efficacy and safety profile conclusively [65]. While traditionally used for wound healing and exhibiting antibacterial and anti-inflammatory properties, its efficacy in conditions like radiation-induced skin reactions remains uncertain due to insufficient evidence from clinical trials.

2.12 *Cassia fistula*

Cassia fistula ('Ehela') is a medium-sized deciduous tree from the Fabaceae family. It features greenish-gray bark and compound leaves composed of three to eight pairs of opposite leaflets and it is known as the "golden shower tree" due to its clusters of golden yellow flowers. *C. fistula* has been traditionally used for various skin ailments, including eczema, with mature leaves ground with lime juice applied topically [30].

Chemical analysis reveals that *C. fistula* seeds are rich in glycerides with linoleic, oleic, stearic, and palmitic acids as major fatty acids, along with other compounds such as lupeol,

β -sitosterol, and hexacosanol. The flower extract contains kaempferol and a proanthocyanidin, while the leaves yield (-)-epiafzelechin, (-)-epicatechin, procyanidin B-2, and other flavonoids. Proanthocyanidins with abnormal configurations have also been observed in pods, along with rhamnetin 3-O-gentibioside from the roots [70].

Recent research suggests the potential therapeutic role of *C. fistula* in treating pemphigus erosions [71]. Studies have demonstrated the beneficial effects of *C. fistula* flower extract on skin health, including increased collagen and hyaluronic acid synthesis, inhibition of collagenase and MMP-2 activity, and reduction of tyrosinase activity associated with hyperpigmentation and skin aging [72]. Topical application of *C. fistula* fruit gel significantly improved the healing of cutaneous lesions in patients with pemphigus vulgaris (PV), indicating its effectiveness as an adjuvant therapy for PV treatment [73]. Furthermore, *C. fistula* extracts have shown significant improvements in skin hydration, water-holding function, and barrier function. These extracts also ameliorated skin aspects such as roughness, dryness, and wrinkles, suggesting therapeutic and esthetic potential in preventing or delaying skin aging [74]. These findings underscore the therapeutic potential of *C. fistula* in addressing various skin conditions, from pemphigus erosions to aging-related skin issues.

2.13 *Carica papaya*

Carica papaya (L.), commonly known as 'papol' in Sri Lanka, is a perennial tree classified in the family Caricaceae. It is characterized by its soft, hollow and cylindrical, trunk and a single stem and the leaves of the papaya tree have long stalks [75].

In Sri Lankan traditional medicine various parts of the *C. papaya* plant was used (including leaves, roots, peel, seed, and pulp) to treat skin infections. Papaya comprises enzymes that help cleanse the skin and unclog pores. Paste of honey, sandalwood powder and lemon juice can kill harmful acne-causing bacteria. Also, the plant was applied to treat issues such as warts, corns, sinuses, eczema, and cutaneous tubercles [76]. 3-Bromo-5-ethoxy-benzaldehyde, Scopoline, colchicine, Ascorbic acid (Vitamin C), α -tocopherol (Vitamin E), γ -tocopherol, campesterol, stigmasterol, β -Sitosterol, cholesterol and β -seline are some specific compounds isolated from *C. papaya* [77].

The study explored the potential of *C. papaya* (papaya) as a botanical therapy for treating skin conditions, particularly focusing on its extracts and compounds. The identification of compounds from papaya seeds, such as n-hexadecanoic acid and benzenedicarboxylic acid, with antiparasitic and antibacterial properties, suggesting their incorporation into the treatment of psoriasis [78]. Additionally, the effectiveness of *C. papaya* leaf in preventing degradation of Type I procollagen and positively modulating transforming growth factor- β 1 (TGF- β 1) activity, indicating its potential for developing cosmetic products targeting various skin conditions, including photoaging [79]. Furthermore, the review in 2021 underscored

the role of *C. papaya* in combating skin aging by addressing oxidative stress and inflammation. The study discussed the mechanisms by which papaya extracts, particularly those from unripe fruits, modulate intracellular stress, antioxidant defenses, and transcription factors like NF- κ B and Nrf2, thereby delaying skin aging processes [80]. The findings of these studies suggest the therapeutic potential of *C. papaya* extracts and compounds in addressing various skin conditions, ranging from psoriasis to photoaging.

2.14 *Cocos nucifera*

Cocos nucifera (L.), commonly known as 'Pol' in Sri Lanka and belonging to the family Arecaceae, is an arborescent monocotyledonous tree that can reach heights of approximately 25 meters, characterized by its dense canopy. Its root system is fasciculate, and the stem is unbranched, featuring a single apical bud protected by a tuft of leaves at its apex. The leaves are pinnate and feather-shaped, consisting of a petiole, rachis, and leaflets [81].

The dried kernel of *C. nucifera* is primarily used for oil extraction, which holds significant importance for domestic use. Coconut oil is renowned for promoting luxurious hair growth protecting the skin from bacterial, protozoal, and viral infections, as well as from ultraviolet radiations. It also serves as an effective treatment for dandruff. Xerosis, a common skin condition characterized by dry, rough, scaly, and itchy skin, has been traditionally addressed using coconut oil as a moisturizer in tropical regions [82].

The basic chemistry of coconut oil reveals saturated fatty acids and medium-chain fatty acids, along with phospholipids, tocopherol, and other minor constituents [83]. The therapeutic properties of *C. nucifera* present promising avenues for the treatment of various skin diseases. Bioactive compounds found in different parts of the coconut demonstrate its potential in addressing dermatological concerns. Coconut oil exhibits antifungal properties against a spectrum of human pathogenic fungi, making it valuable in combating dermal mycosis [84]. Moreover, it enhances skin hydration and lipid levels, comparable to conventional emollients like mineral oil [85]. Studies also support its anti-inflammatory, antipyretic, and wound-healing properties, making it effective against inflammation, fever, and wounds [86]. Both fresh juice and aqueous kernel extract show promising results in wound healing assays. Furthermore, coconut oil demonstrates antimicrobial activity against pathogenic bacteria, including antibiotic-resistant strains, and against herpes simplex virus type 1, expanding its scope in addressing viral dermatological conditions [87]. Overall, the comprehensive therapeutic profile of *C. nucifera*, encompassing its antifungal, moisturizing, anti-inflammatory, wound-healing, and antimicrobial properties, positions it as a promising candidate for novel treatments for a range of skin diseases. Further research and clinical trials are warranted to fully elucidate its efficacy, safety, and optimal formulations for dermatological applications.

2.15 *Elaeocarpus serratus*

Elaeocarpus serratus (L.), commonly known as 'veralu' is a fruit tree belonging to the Elaeocarpaceae family. It blooms from September to October, bearing ovoid or globose berries prized for their sour-sweet taste and aroma. In traditional medicine, paste of *E. serratus* leaves, often combined with *Psidium guajava*, has been used for centuries as a home remedy for dandruff. Water extracts of its leaves are utilized in anti-head lice and anti-dandruff treatments in rural Sri Lanka, with applications ranging from scalp cleansing to hair care [88-90].

Phytochemical screening of *E. serratus* reveals compounds like β -amyryn, stigmasterol, kaempferol, and quercetin, indicating its rich chemical profile. Chemical investigation further uncovers myricitrin, mearnsetin 3-O- β -D-glucopyranoside, mearnsitrin, and tamarixetin 3-O- α -L-rhamnopyranoside in its leaves [91, 90]. Studies demonstrate the antibacterial and antifungal properties of *E. serratus* extracts, particularly from the leaf and stem bark, suggesting efficacy against various pathogens associated with skin infections. Additionally, its bark extract exhibits high elastase inhibitory activity and potent antioxidant properties, suggesting potential for anti-aging formulations in cosmetics [92, 93]. The presence of bioactive compounds in *E. serratus* leaves, such as flavonoids and fatty acids, contributes to its medicinal properties, including anti-inflammatory, antifungal, and antioxidant activities. These attributes align with Ayurvedic principles, suggesting efficacy in managing inflammatory skin conditions like seborrheic dermatitis [94]. However, while in vitro studies provide promising evidence, further clinical investigations are necessary to establish the efficacy and safety of *E. serratus*-based treatments conclusively.

The multifaceted therapeutic profile of *E. serratus* underscores its significance as a valuable botanical resource in dermatology. Its traditional use in naturopathic medicine, coupled with modern scientific research validating its pharmacological activities, highlights its potential for the development of novel skincare formulations and therapies.

3. Conclusion

Sri Lanka has rich biodiversity with many plant resources and has a long history of traditional medicine based on plant remedies. A significant number of medicinal plants grown in Sri Lanka have been documented with ability to cure certain skin diseases. This review highlights some medicinal plants used to treat some skin diseases in the Sri Lankan traditional system of medicine. A total of fifteen medicinal plants with therapeutic potential to treat skin diseases are described. Extracts of selected medicinal plants and isolates have been studied against skin diseases like acne, leprosy, leishmaniosis, eczema, warts and cutaneous tubercles etc. Most of these studies were conducted as pre-clinical studies and they have shown the effectiveness of the described plant extracts/compounds against some skin diseases. Further studies on

these extracts/metabolites might be useful to develop them as an alternative therapy to treat skin diseases.

Conflicts of Interest

The authors have no conflicts of interest.

Table 1: Summary of Sri Lankan Plants with Potential for Treating Skin Diseases

Plant Scientific Name	Common Name	Sri Lankan Name	Medicinal Properties	References
<i>Curcuma longa</i>	Turmeric	“Kaha”	Used for skin diseases, fungal infections, pimples	[7], [8], [11]
<i>Azadirachta indica</i>	Neem	“Kohomba”	Given for intestinal worms, jaundice, skin diseases	[15], [16], [17], [18]
<i>Coscinium fenestratum</i>	Tree turmeric	“Weni wel”	Used for ophthalmopathy, inflammation, ulcers, skin disease, jaundice, fever, general debility	[22], [23]
<i>Hemidesmus indicus</i>	Indian Sarsaparilla	“Iramusu”	Used for fever, urinary diseases, skin diseases, burns, sores	[26], [27]
<i>Ricinus communis</i>	Castor Oil Plant	“Beheth Endaru”	Given for lumbago, sciatica, pleurodynia, skin diseases	[8], [30], [31]
<i>Mimosa pudica</i>	Sensitive Plant	“Nidikumba”	Treat in bleeding disorders, skin diseases	[8], [36], [37]
<i>Moringa oleifera</i>	Moringa	“Murunga”	Used in skin infections, anaemia, asthma, rheumatism, digestive disorders	[40], [43]
<i>Ixora coccinea</i>	Jungle Geranium	“Rathmal”	Used for dysentery, fever, skin diseases, eye diseases	[42], [43], [44]
<i>Atalantia ceylanica</i>	Yakinaran	“Yaki Naran”	Given for catarrh, asthma, rheumatism, skin diseases, bee stings	[46], [47], [49]
<i>Murraya koenigii</i>	Curry Leaves	“Karapincha”	Used in skin and hair care	[52], [53], [54], [55]
<i>Aloe vera</i>	Aloe Vera	“Komarika”	Used for skin burns, sunburns, pimples	[10], [58]
<i>Cassia fistula</i>	Golden Shower	“Ehela”	Used to treat eczema and skin problems	[30], [64]
<i>Carica papaya</i>	Papaya	“Gaslabu”/“Papol”	Treat skin infections and killing acne-causing bacteria	[70], [71]
<i>Cocos nucifera</i>	Coconut Tree	“Pol”	Protects the skin from bacterial, protozoal, viral infections, and from ultraviolet radiations Coconut oil is a good treatment to get rid of dandruff.	[76], [77]
<i>Elaeocarpus serratus</i>	Ceylon Olive	“Weralu”	Remedy for dandruff and head lice	[88], [89], [90]

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