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EVALUATION OF THE USAGE OF ETHNOBOTANICAL MEDICINAL PLANTS IN THE TREATMENT OF SKIN DISEASES IN INDIA

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ABSTRACT

Traditional knowledge is an ancient technique or skill set that was passed down through generations within a tribe, local people, or family lineage. More research is needed to determine if chemical, microbiological, and clinical data supports ethnodermatological usage of medicinal plants in India for skin problems. This review paper clarifies and highlights the crucial aspect of ethnodermatology, specifically the traditional knowledge of medicinal plants and its utilisation for various skin ailments in India. Also, evaluation and elucidation of dermatology within Ayurvedic and Unani medicine. Various key phrases, including "Indian traditional ethnodermatology," "ethnodermatology," "ethnobotany," "skin diseases," "Ayurveda dermatology," and "pharmacological activity," were queried in online search platforms such as Google Scholar (https://scholar.google.com/), ResearchGate (https://www.researchgate.net/), PubMed (https://pubmed.ncbi.nlm.nih.gov/), and the NISCAIR Online Periodicals Repository (NOPR) (http://nopr.niscair.res.in/). In result the understanding and application of herbal therapy in the Indian subcontinent possess significant potential for addressing various human skin problems. The administration of extracts from the majority of plant species is topical with only a few being administered orally. We also examined the pharmacological efficacy of the extracts from the most often referenced plants against murine models, bacterial and fungal infections, and human cells. Millions of Indians choose complementary dermatological care. This evaluation of ethnobotanical dermatology in India supports the idea that it will speed up the identification of novel effective skin disease treatments. This article should drive the development of a new generation of natural human skin therapies to address consumer demand for safe, sustainable, and natural treatments. Thus, ethnodermatology plant study in India and abroad should be increased.

KEYWORDS: Ethinobotanical plants, Skin diseases, Antimicrobial activities, Medical properties.

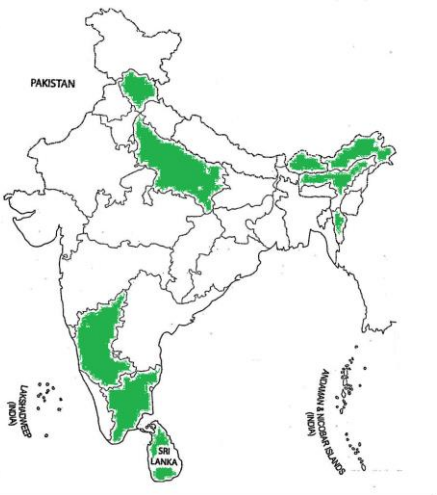
1. INTRODUCTION

The complementary or traditional medicinal system among various cultural and socio-religious practices is significantly influences healthcare across the Indian subcontinent. Complementary and Alternative Medicine (CAM) in dermatology encompasses a diverse array of diagnostic and therapeutic approaches that enhance traditional dermatological procedures by integrating CAM principles with contemporary research insights.[1] Complementary and Alternative Medicine (CAM) primarily emphasises holistic treatment of the human body with the expectation that this

methodology will enhance dermatological care. The World Health Organisation (WHO) reports that over 80% of the global population depends on traditional herbal remedies. Approximately 40,000 to 70,000 kinds of medicinal plants are employed globally as traditional remedies. The global commerce in medicinal plants and their derivatives is currently valued at US$ 100 billion with an annual growth rate of 15%.

Notably, around 25% of modern pharmaceuticals are sourced directly or indirectly from plants, Plants and their immobile nature have developed the ability to produce an extraordinary array of chemicals. Consequently, some compounds are challenging to synthesise chemically in the laboratory and the procedure is frequently not commercially viable. The structural complexity of these plant-derived compounds has directly contributed to their extensive therapeutic effects.[2-10] Consequently, plants are consistently the sole source of these pharmacologically important macromolecules.[11-13]

India is one of the seventeen global mega biodiversity centres and encompassing four biodiversity hotspots: Western Ghats-Sri Lanka, Indo-Burma, Sundaland, and Himalaya (Fig. 1).[14] The Botanical Survey of India (BSI) has reported that among the 45,000 identified plant species at least 30,000 (two-thirds) has significant therapeutic potential. Local inhabitants employ some plants as herbal remedies which are efficacious against various ailments. The utilisation of traditional remedies for dermatological conditions is a well-established and often employed practice in India. Contemporary healthcare institutions are frequently absent in remote regions. Consequently, conventional drugs are generally utilised to resolve healthcare concerns.[17] A total of 84 kinds of medicinal plants are utilised in dermatology across India. Particular plant species were identified in four Indian states: Tamil Nadu (24 species), followed by Karnataka (17 species), and both Assam and Uttar Pradesh (nine species each) (Fig. 1). The accessibility of herbal plants their reduced cost, and minimal or nonexistent adverse effects have led to an increasing demand for their use as therapies for numerous dermatological conditions.[18]. In India, despite the availability of modern medical systems, a significant segment of the population continues to pursue the advantages of various alternative therapies, such as Ayurvedic and Unani systems.



Biodiversity hotspots: Western Ghats-Sri Lanka, Indo-Burma, Sundaland, and Himalaya

Plant species were identified in four Indian states	
Tamilnadu	24
Karnataka	17
Assam	9
Uttar Pradesh	9

Fig. 1: Number of plant species reported from specific Indian states.

Ethnodermatology is a branch of ethnomedicine and ethnobiology focused on the diagnosis and treatment of diverse skin disorders, skincare, and aesthetic practices within ethnic groups. The significance of the skin to the overall physiology of the human body is evident as substantial systemic problems arise following extensive and severe skin injury from burns or generalised dermatitis.[19] The epidermal barrier restricts passive water loss from the body and inhibits the absorption of environmental substances that protects against microbial infections.[20] Significant research has demonstrated that natural plant-derived substances have a substantial promise for cutaneous protection.[18] Numerous herbal traditional medicines in India have been documented for the treatment of various skin diseases including acne, bruising, and burns. Additionally, medicinal herbs are frequently employed to treat cuts, wounds, dermatological conditions, ringworm, eczema, leprosy, scabies, and similar ailments. Indigenous and local populations often utilise plant parts such as leaves, fruits, seeds, and roots for the maintenance and safeguarding of human skin, its enhancement, or the treatment of related ailments.[19] Cannabis indica has exhibited anti-inflammatory, antipruritic, anti-aging, and anticancer activities through several pathways including interaction with the recently discovered endocannabinoid system of the skin. Thus, presenting a possible alternative to conventional treatments.[21] Furthermore, cosmetic corporations are progressively using fundamental research discoveries in the chemical and biological sciences to develop more advanced products in this sector. The cosmetics sector in Europe has a market value of €65 billion and employs approximately 500,000 individuals i.e either directly or indirectly. Nevertheless, no exhaustive compilation of ethno-dermatological reports has been attempted to date. Moreover apart from limited evidence, the clinical significance of these prevalent traditional practices remains undocumented.

The objective of the study is to aggregate and highlight the crucial aspects of ethnodermatology and specifically the traditional knowledge of medicinal plants and their applications for various skin ailments in India. We also provide a concise review and elucidation of dermatology in Ayurvedic and Unani medicine. We examine the pharmacological efficacy of extracts from many well referenced herbs in relation to problematic skin conditions.

2. METHODOLOGY

Various key phrases, including “Indian traditional ethnodermatology,” “ethnodermatology,” “ethnobotany,” “skin diseases,” “Ayurveda dermatology,” and “pharmacological activity,” were utilised in online search engines and databases such as Google Scholar (https://scholar.google.com/), ResearchGate (https://www.researchgate.net/), PubMed (https://pubmed.ncbi.nlm.nih.gov/), Scopus, and NISCAIR Online Periodicals Repository (NOPR) (http://nopr.niscair.res.in/), thereby employing the relevant databases and keywords. This study exclusively covered papers published in English from 2000 to October 2024 fig.2. A total of 1078 studies were included following an initial screening of 453 published papers. Based on data acquired from several online search engines, we developed numerous significant discoveries. Table 1 delineates plant species utilised in traditional medicine for dermatological ailments in India; Table 2 elucidates the pharmacological properties of medicinal plants along with their preclinical evidence; Table 3 details clinical evidence regarding the use of plants in humans. Species nomenclature was verified using The Plant List 1.1 (“The Plant List,” 2013), while family classifications adhere to the Angiosperm Phylogeny Group IV.[23]

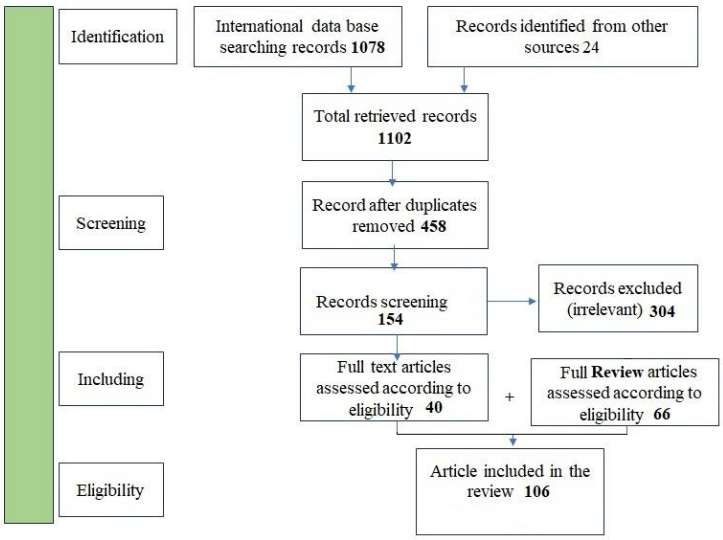


Figure 2: Screening research and review articles for the composition of review papers from 2000 to 2024.

2.1. Skin care in traditional Ayurvedic medicine

Ayurveda, meaning the science of life in Sanskrit is deeply entrenched in South Asian history and culture. In India, comprehensive accounts of many dermatological therapies are documented in Ayurvedic literature. The aetiology of diverse dermatoses encompasses food habits, daily routines, climatic factors, and sexual behaviour. In Ayurveda, "Rasayana drugs" are seen crucial for the treatment of dermatological problems.[1] Rasayana medicines possess immunomodulatory, adaptogenic, antioxidant, nootropic, and antistress properties. In Ayurveda, it is essential to analyse prakruthi (nature) and local skin pathology and referred to as Sthaneeya-vikruthi in Sanskrit which is prior to prescribing. Specifically, prakruthi is deemed significant for long-term health management whereas its effectiveness for immediate short-term control is limited. In this regard, vikruthi is crucial for the short-term control of symptoms in dermatological conditions.

Ayurveda posits the existence of three separate doshas or energies (*vata, pitta, and kapha*) that are said to flow within the body and regulating both physical and mental functions. This indicates intricate patterns of various symptoms and signs that yield characteristic "constellations" of clinical manifestations with approximately 18 disorders categorised under the Ayurvedic chapter on *kustha* (denoting skin disease).[24] Ayurvedic medicine has elucidated skin problems through causation, aetiology, clinical manifestations, and efficacious treatment. Persistent dermatological conditions, such as leprosy are induced by imbalances among various doshas. The consumption of conflicting liquids and foods, fasting, excessive exercise, raw or undercooked food, drinking cold water after prolonged sun exposure, early meal consumption before digestion of prior intake, excessive emetic therapy, laxative treatment, medical enemas, and inhalation therapy are responsible for these diseases. Ayurvedic medicine employs several preparations for the treatment of skin diseases including medicinal plants: tinctures, ointments, emulsions, pastes, tablets, suppositories, patches, lotions, liniments, oils, and bougies. Additionally, chemical elements and inorganic compounds such as copper, gold, lead, mercury, silver, sulphur, tin, zinc, zinc carbonate, alum, borax, and iron sulphate are referenced.[17] Applying lemon is the most effective home treatment for acne. The decoction of some plants, including Justicia adhatoda L. (synonym: Adhatoda vasica Nees, Acanthaceae) (Vasak), Acorus calamus L. (Acoraceae) (Vaka), Trichosanthes dioica Roxb. (Cucurbitaceae) (Patola), and Azadirachta indica. A. Juss. (Meliaceae) (Neem), Catunaregam spinosa (Thunb.)

Tirveng. (Randia dumetorum (Retz.) Poir., Rubiaceae) (Madana) combined with honey, alongside a paste derived from many plants including Curcuma longa L. (Zingiberaceae), Senna alata (L.) Roxb (Fabaceae), and Cynodon dactylon (L.). Pers. (Poaceae), Lawsonia inermis L. (= Lawsonia alba Lam., Lythraceae), and Terminalia chebula Retz. (Combretaceae) are utilised for the treatment of several dermatological conditions, including pruritus, urticaria, eczema, lacerations, acne, psoriasis, dermatitis, dermatophytosis, syphilis, and scabies.[17,25] An aqueous extract of T. chebula demonstrated greater inhibitory effects than ethanol extracts.[26] It is important to note that from an Ayurvedic perspective, psoriasis is not a singular disease rather various vikruthis and prakruthis might culminate in the same manifestation of psoriasis. This instance complicates the management of psoriasis.

Table 1: Conventional medicine for dermatological disorders in India.

Plant name	Family	Used against	Ref.
Acalypha indica L.	Euphorbiaceae	Eczema of hands, sole on legs, burning area, ringworm	27
Croton bonplandianus Baill.	Euphorbiaceae	Scabies, sores, Cuts, wounds, Ringworm	27
Jatropha curcas L.	Euphorbiaceae	Leucoderma, sores, pimple	27
Ricinus communis L.	Euphorbiaceae	Skin diseases, wart, wounds	27
Citrus limon (L.) Osbeck	Rutaceae	Anticeptic	28
Eclipta prostrata (L.) L.	Asteraceae	Herpes, infective hepatitis	29
Coscinium fenestratum Colebr.	Menispermaceae	Herpes, infective hepatitis	29
Croton persimilis Müll. Arg. (= *Croton roxburghii* N.P. Balakr., illeg. name)	Euphorbiaceae	Herpes, infective hepatitis	29
Bambusa vulgaris Schrad.	Poaceae	Skin rashes	29
Calotropis procera (Aiton) Dryand.	Apocynaceae	Eczema, abdominal cramps, ringworms, snake bites and wound healing	29
Allium cepa L.	Amaryllidaceae	Eczema, ear infection, Inflammatory swelling	29,30
Aloe vera (L.) Burm.f.	Asphodelaceae	Severe and prolonged allergic dermatitis	31
Curcuma longa L.	Zingiberaceae	Premature skin wrinkle, excessive melanin secretion, hyperpigmentation	32,33
Azadirachta indica A. Juss.	Apocynaceae	Wart	34
Calotropis procera (Aiton) Dryand.	Asteraceae	Acne	34
Calendula officinalis L.	Combretaceae	Skin disease, skin itching	35
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Brassicaceae	Leprosy	36
Brassica nigra (L.) K. Koch	Fabaceae	Wound healing	37
Desmodium oojeinense (Roxb.) H.Ohashi (= *Ougeinia oojeinensis* (Roxb.) Hochr.)	Araceae	Skin diseases, ulcer, body inflammation	37
Rhaphidophora pertusa (Roxb.) Schott	Apocynaceae	Wart	38
Calotropis gigantea (L.) Dryand.	Apocynaceae	Scabies, skin infection	39
Dendrophthoe falcata (L.f.) Ettingsh.	Loranthaceae	Skin ulcers	39
Neolamarckia cadamba (Roxb.) Bosser	Rubiaceae	Skin diseases	40
Curculigo orchioides Gaertn.	Hypoxidaceae	Itching, skin diseases	40
Pongamia pinnata (L.) Pierre	Fabaceae	Burning area	41
Lepidagathis incurva Buch.-Ham. ex D. Don	Acanthaceae	Measles	42
Rhinacanthus nasutus (L.) Kurz	Acanthaceae	Ringworm	42
Centella asiatica (L.) Urb.	Apiaceae	Syphilis	42
Excoecaria oppositifolia var. *crenulata* (Wight)	Euphorbiaceae	Affected area of skin	43

Chakrab. & M.Gangop. (= *Excoecaria crenulata* Wight)			
Allium sativum L.	Amaryllidaceae	Leprosy, ringworm, scabies	43
Basella alba L. (= *Basella rubra* L.)	Basellaceae	Urticaria	43
Bischofia javanica Blume	Phyllanthaceae	Insect bite	44
Datura stramonium L.	Solanaceae	Eczema, pediculosis	44
Dodonaea viscosa (L.) Jacq.	Sapindaceae	Skin infections, skin rashes, sore throat, dermatitis	45
Rhinacanthus nasutus (L.) Kurz	Acanthaceae	Ringworm, skin diseases, chronic wound	45
Cissampelos pareira L.	Menispermaceae	Pruritus, skin disorder	45
Anacardium occidentale L.	Anacardiaceae	Leprosy	46
Crinum viviparum (Lam.) R.Ansari & V.J.Nair (= *Crinum defixum* Ker Gawl.)	Amaryllidaceae	Tinea cruris	46
Wrightia tinctoria R. Br.	Apocynaceae	Psoriasis	46
Caesalpinia crista L.	Fabaceae	Scabies, skin allergies	47
Aristolochia indica L.	Aristolochiaceae	Wart	47
Globba marantina L.	Zingiberaceae	Leukoderma	48
Biophytum sensitivum (L.) DC.	Oxalidaceae	Scabies, skin rashes, eczema	49
Cissampelos pareira L.	Menispermaceae	Leprosy, scabies, ringworm infection	49
Rauvolfia serpentina (L.) Benth. ex Kurz	Apocynaceae	Ringworm, Scabies	49
Canthium coromandelicum (Burm. f.) Alston (= *Canthium parviflorum* Lam.)	Rubiaceae	Eczema, leucoderma, scabies	49
Scleria lithosperma (L.) Sw.	Cyperaceae	Leucoderma, eczema	49
Cuscuta reflexa Roxb.	Convolvulaceae	Scabies, cut, injuries	50
Acorus calamus L.	Acoraceae	Bites, cuts, wounds	51
Ageratum conyzoides (L.) L.	Asteraceae	Wormy skin sores	51
Aphanamixis polystachya (Wall.) R. Parker	Meliaceae	Skin disease	52
Ocimum tenuiflorum L. (= *Ocimum sanctum* L.)	Lamiaceae	Ringworm	53
Tamarindus indica L.	Fabaceae	Swelling on hands and legs	53
Nyctanthes arbor-tristis L.	Oleaceae	Smoothen rough skin	54
Exacum tetragonum Roxb.	Gentianaceae	Sores of leech bites	54
Abrus precatorius L.	Fabaceae	Leucoderma Dandruff	55
Justicia adhatoda L. (= *Adhatoda zeylanica* Medik.)	Acanthaceae	Abscesses	55
Curcuma aromatica Salisb.	Zingiberaceae	Scabies, ringworm	55
Bombax ceiba L.	Malvaceae	Cattle wounds	56
Argemone mexicana L.	Papaveraceae	Skin infection, leprosy	57
Tabernaemontana undulata Vahl	Apocynaceae	Syphilis	58
Arisaema jacquemontii Blume	Araceae	Ringworm, skin disease	59
Woodfordia fruticosa (L.) Kurz	Lythraceae	Skin diseases	60
Christella dentata (Forssk.) Brownsey & Jermy	Thelypteridaceae	Skin infection	58
Euphorbia hirta L.	Euphorbiaceae	Cuts, Eczema, ringworm, skin diseases	61
Pongamia pinnata (L.) Pierre	Fabaceae	Eczema, skin infection	61
Erythroxylum monogynum var. *caffrum* Eyles	Erythroxylaceae	Affected skin	62
Anisochilus carnosus (L.f.) Wall.	Lamiaceae	Itching	63
Cassia fistula L.	Fabaceae	Ringworm, skin infection, astringent	61
Sonchus arvensis L.	Asteraceae	Leprosy, white spot of skin, ringworm	61
Streblus asper Lour.	Moraceae	Measles like swellings on the skin	64

Lantana camara L.	Verbenaceae	Wounds	64
Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	Unnecessary peelings on the skin	64
Indigofera aspalathoides DC.	Fabaceae	Psoriasis	64
Bauhinia variegata L.	Fabaceae	Leprosy, skin diseases	61
Momordica charantia L.	Cucurbitaceae	Eczema	61
Tectona grandis L. f.	Lamiaceae	Ulcer, skin diseases	65
Aristolochia bracteolata Lam.	Aristolochiaceae	Boils, skin disease	65
Bryophyllum pinnatum (Lam.) Oken (= *Kalanchoe pinnata* (Lam.) Pers.)	Crassulaceae	Skin burn	66
Bidens pilosa L.	Asteraceae	Cut, wound	66
Alpinia galanga (L.) Willd.	Zingiberaceae	Local inflammation, skin allergy caused by insect bites or microbes	66
Oxalis corniculata L. (= *Oxalis corniculata* subsp. *albicans* (Kunth) Lourteig)	Oxalidaceae	Skin allergies	67

2.2. Medicinal plants utilised in the management of dermatological conditions in India

In Uttar Pradesh, a total of 11 medicinal plant species including Acalypha indica L., Phyllanthus emblica L. (synonymous with Emblica officinalis Gaertn.), Jatropha curcas L., and Euphorbia thymifolia Burm i.e all belonging to the Euphorbiaceae family are utilised as home remedies for various skin ailments such as eczema, leprosy, pruritus, wounds, ringworm, warts, and scabies. Also Additionally, 92 species of medicinal plants were identified, with Azadirachta indica A. Juss, Melia azedarach L. (both from Meliaceae), and Curcuma longa L. (Zingiberaceae) being the most prevalent and widely utilised for dermatological health issues. In Coastal Karnataka[28] documented 25 out of 57 plant species, including Abrus precatorius L. (Fabaceae), Bridelia retusa (L.) Spreng (Phyllanthaceae), and Rotheca serrata (L.). Steane & Mabb (equivalent to Clerodendrum serratum (L.)). Moon, Lamiaceae, possesses antiviral and several antibacterial properties.[28] Additionally, 16 plant species, including Azadirachta indica A. Juss., Eclipta prostrata (L.) L. (Asteraceae), and Celastrus paniculatus Willd. (Celastraceae), exhibit anti-inflammatory properties. The latter species also exhibited antifungal inhibitory action.[26] Ten species, including Acorus calamus L., Curcuma longa L., and Centella asiatica (L.) Urb. (Apiaceae), are recognised for their wound and ulcer healing properties. Additionally, six species, such as Cyclea peltata Hook. f. & Thomson (Menispermaceae), Centella asiatica (L.) Urb., and Hemidesmus indicus (L.) R. Br. ex Schult. (Apocynaceae), possess cooling properties, while Citrus limon (L.) Osbeck (Rutaceae) is noted for its antiseptic property.

This review also documents the effective application of Areca catechu L. (Arecaceae), Aristolochia indica L. (Aristolochiaceae), Coscinium fenestratum Colebr (Menispermaceae), and Rauvolfia serpentina (L.). Benth. ex Kurz (Apocynaceae), Curcuma longa L. for the treatment of herpes . According to current of research paper ,85 plant species from 49 families have been reported for their medicinal application in skin therapy in Assam.[28,44] In examples of these medicinal plants are Allium sativum L. (Amaryllidaceae), Justicia adhatoda L., Swertia chirata Buch.-Ham. ex C.B. Clarke [unresolved name, Gentianaceae], and Vitex negundo L. (Lamiaceae), among others.[44] In Tamil Nadu, SE India, 88 plants were examined for their efficacy in treating 15 distinct skin ailments; 46 plants were identified for ringworm, 41 for scabies, 24 for eczema, nine for leprosy, seven for cuts and wounds, five each for dandruff and skin inflammation, three for alopecia, and two each for treating cracked feet, cysts, polyps, acne, and prickly heat.[49] The 88 plants are classified into 52 families, including Ceasalpiniaceae, Asteraceae, Euphorbiaceae, Fabaceae, Apocynaceae, Aristolochiaceae, Cucurbitaceae, Malvaceae, Rubiaceae, and Zingiberaceae . Notable species in this study include Azadirachta indica A. Juss., Curcuma aromatica Salisb (Zingiberaceae), and Aloe vera (L.). Burm. f. (Asphodelaceae), Canthium coromandelicum (Burm. f.) Alston (= Canthium parviflorum Lam., Rubiaceae), Heliotropium indicum L.

(Boraginaceae), among others.[31,32] Documented a total of 54 medicinal plants from 34 families utilised for the treatment of skin ailments, including eczema, pruritus, lacerations, burns, and leucoderma, in Bihar, eastern India. This study identifies the predominant families as Fabaceae, Lamiaceae, and Euphorbiaceae, with notable medicinal plants including Cuscuta reflexa Roxb. (Convolvulaceae), Bombax ceiba L. (Malvaceae), Datura metel L. (Solanaceae), and Indigofera tinctoria L.[50] The Tharu community in Udham Singh Nagar, Uttarakhand, utilised ninety plant species from 86 genera and 48 families for the treatment of various skin ailments including body infections (2 species), boils (32 species), burns (4 species), chilblains (2 species), cracked heels (2 species), cuts (18 species), dandruff (3 species), eczema (10 species), hair loss (2 species), itching (7 species), leprosy (11 species), leucoderma (4 species), ringworm (5 species), toe infections (2 species), and wounds (38 species) (Fig. 2). Based on usage value (UV), the plant species most favoured for the treatment of cutaneous disorders was Ricinus communis L. (Euphorbiaceae) followed by Azadirachta indica A. Juss., Ageratum conyzoides (L.) L. (Asteraceae), Allium cepa L. (Amaryllidaceae), and Tridax procumbens (L.) L. (Asteraceae).[69] The medicinal plants utilised for treating skin problems in northeastern India i.e Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura were documented.[52] This study recorded 275 plant species across 93 families, with the predominant species being Lepidagathis incurva Buch.-Ham. ex D. Don (Acanthaceae), Achyranthes aspera L. (Amaranthaceae), Nerium oleander L. (= Nerium indicum Mill., Apocynaceae), and Centella asiatica (L.) Urb., among others.[52]

Ethnopharmacological methods and data regarding lesser-known Indian flora utilised in the management of cuts, wounds, and burns have been assembled.[70,71] In this study, 51 plant species were identified, with 31% utilised for wound healing, 29% for cuts, 10% for burns, and 22% for both cuts and wounds (Fig. 3). Sixty-four other Indian herbs were documented for their wound healing properties.

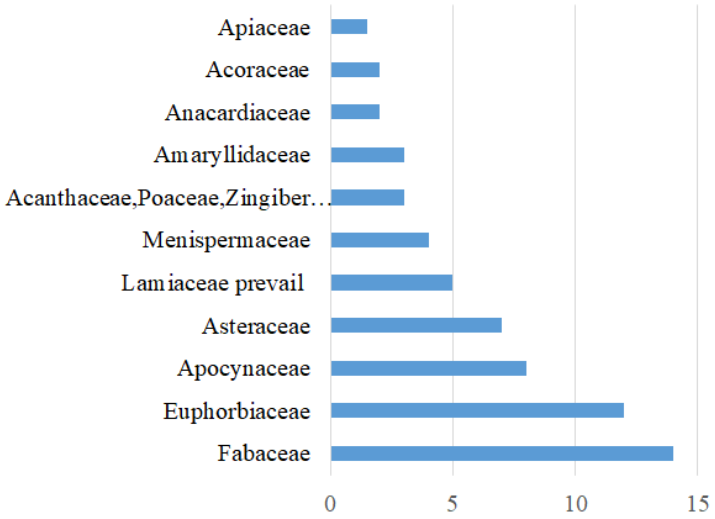


Fig. 3: Ethnodermatological drugs by plant families used in India. Plants of Fabaceae, Euphorbiaceae, Apocynaceae, Asteraceae, Lamiaceae prevail. X axis: number of plant species reported.

2.3. Pharmacological activity in preclinical and clinical evidence

Plants utilised in dermatology ethnomedicine have been validated by numerous pharmacological, clinical, and preclinical investigations. This section presents a detailed summary of several investigations conducted to evaluate the bioactivity of plant extracts, fractions, and chemical compounds in in vitro, ex vivo, and in vivo assays for distinct skin

conditions. Tables 2 and 3 present the pharmacological investigations and the biological actions of plant extracts include anti-inflammatory, antifungal, wound healing, antiulcer, and antioxidant properties (Fig. 2). The majority of plant extracts are produced utilising ethanol or methanol. Skin health is preserved by directly influencing the various layers and cells of the skin implicated in the ageing process and the aetiology of skin disorders. Leprosy, often known as Hansen's disease (HD), is a chronic infectious condition caused by the slow-growing bacteria Mycobacterium leprae or M. lepromatosis. The severe illness mostly impacts the integumentary system, the upper respiratory tract (mucosal surfaces), peripheral nerves, and ocular structures. The symptoms include dermal lesions, neurological impairment, erythematous or hypopigmented skin patches, weakness in the extremities, numbness, and diminished sensation. Transmission occurs by droplets from the nose and mouth during close and frequent contact with untreated individuals. Leprosy is treated with multidrug treatment (MDT). Numerous medicinal plants utilised in the treatment of leprosy, including the leaves or root paste of Amaranthus spinosus L. (Amaranthaceae), Withania somnifera (L.) Dunal (Solanaceae), bark decoction of Cassia fistula L. (Fabaceae), whole plant decoction of Centella asiatica (L.) Urb., root paste of Solanum viarum Dunal (Solanaceae), and fruit paste of Momordica charantia L. (Cucurbitaceae). Additionally, Mimosa pudica L. (Fabaceae) was noted to assist in leprosy treatment. The antibacterial efficacy of M. pudica methanol extract was evaluated against Aspergillus fumigatus, Citrobacter divergens, and Klebsiella pneumoniae at varying doses of 50, 100, and 200 µg/disc. The anti-inflammatory efficacy of M. pudica leaf ethanol extract at dosages of 200 and 400 mg/kg was evaluated for its considerable reduction of carrageenan-induced paw oedema revealing a more marked analgesic effect in the acetic acid writhing model compared to the tail-flick model.[74]

Kumar et al. (2014) investigated the extraction of the stem bark of Millingtonia hortensis L. f. (Bignoniaceae) utilised for addressing Dapsone resistance in leprosy.[75] The bactericidal efficacy of M. hortensis extract was assessed using the well diffusion method. This method utilised Escherichia coli as the test organism. Four wells, each 10 mm in diameter, were created in all agar plates. Approximately 0.3 ml of plant extract at varying concentrations was introduced into each well using a sterilised dropper pipette. A kanamycin disc was placed at the centre of the plates, which were subsequently incubated at 37 °C for 20 hours. The diameter of the inhibition zone was measured to assess antimicrobial activity. GC-MS analysis was conducted on the methanolic and ethanolic extracts of M. hortensis in this work. Singh et al. (2013) investigated the anti-inflammatory properties of a methanol extract (400 mg/kg) from the Cassia species (Fabaceae) which resulted in maximum reductions of oedema of 53.57%, 40.33%, 31.37%, and 29.15% after 3 hours in serotonin-induced, carrageenin, dextran, and histamine rat paw oedema, respectively. Additionally, the extract demonstrated a 48.13% decrease in granuloma weight in the granuloma pouch model in rats during the chronic test.[76] The methanolic seed extract of Cassia species demonstrated antiulcer efficacy and achieving 75% protection in a pylorus ligation model and 70.31% protection against indomethacin-induced ulcers in Wistar albino rats.[77] The antipyretic efficacy of the root extract of Calotropis gigantea (L.) Dryand. (Apocynaceae) was demonstrated in yeast-induced fever and TAB (Typhoid) vaccine-induced pyrexia in rats and rabbits.[76]

Ringworm is a fungal infection affecting the skin or scalp, sometimes referred to as dermatophytosis, dermatophyte infection or tinea. Three distinct genera of fungi can induce ringworm: Epidermophyton sp., Microsporum sp., and Trichophyton sp. These fungus exist in the soil as spores. The infection initially manifests as erythematous lesions on the affected skin regions and subsequently disseminates to other sites of the body. It may impact the scalp, groin, chin, feet, nails, or additional regions. Singh et al. (2015) reported that Lawsonia inermis L. was utilised as a treatment for

ringworm, demonstrating anti-inflammatory properties attributed to extracted compounds specifically methyl naphthalene carboxylate and 1, 5-Diphenylpent-3-en-1-ynes (derived from leaves and stems). These compounds were evaluated in an in-vitro bioassay by measuring elastase release and superoxide production in human neutrophils, with an IC50 range of 1.58–1.80 µg/ml. Additionally, the crude ethanol leaf extract along with butanol, chloroform, and water fractions, exhibited efficacy in an anti-inflammatory model in rats. This investigation recorded the wound healing effects of L. inermis ethanol leaf extract on male Wistar rats using excision and dead space models, as well as on Sprague Dawley rats employing excision, incision, and dead space models.[78] Ndhlala et al. (2015) investigated Achyranthes aspera L. for the treatment of ringworm. The antifungal efficacy of methanol extracts from A. aspera leaves against Candida albicans (ATCC10231), a diploid yeast fungus, was evaluated using a microdilution assay. The anthelmintic activity was evaluated against Caenorhabditis elegans var. Bristol (N_2), a free-living worm, utilising a modified fast colorimetric microdilution technique to determine the minimum lethal concentration (MLC) values.[79] Ibrahim and Osman (1995) indicated that the leaves of Senna alata (L.) Roxb. (= Cassia alata L.) possess a laxative effect and are utilised for treating ringworms. The antimicrobial activity of these plant extracts was assessed using the diffusion method and involving 1 ml of 10^5 bacterial cell inoculum, or 4×10^5 yeast cells or fungal spores per plate, with discs containing a concentration of 500 mg/ml, incubated at 30 °C for three days for fungi, or at 37°C overnight for bacteria.[80] In vitro findings indicated that the extract had significant efficacy against dermatophytic fungus while demonstrating minimal efficacy against non-dermatophytic fungi.

Acne

Acne is the most prevalent dermatological condition, classified into three primary types: acne vulgaris, acne conglobata, and acne rosacea. This is a dermatological disorder that arises when hair follicles become obstructed by sebum and desquamated skin cells. It frequently results in blackheads, whiteheads, or pimples, manifesting on the face, forehead, chest, upper back, and arms. Manvitha and Bidya (2014) indicated that Cymbopogon citratus (DC.) Stapf (Poaceae) (lemongrass) enhances skin condition by diminishing acne and pimples, and functions as a muscle and tissue toner.[81] The ethanolic extracts of lemongrass leaves were investigated for their possible antibacterial effects against Staphylococcus aureus, with flavonoids and tannins identified as the causative compounds. Kumar et al. (2007) reported the antibacterial evaluation of 12 Indian medicinal herbs against acne-inducing microorganisms.[70] This study evaluated the antimicrobial activity of 12 medicinal ethanolic plant extracts against Propionibacterium acnes and Staphylococcus epidermidis using the disc diffusion method. The extracts included 300 g of Verbena officinalis L. (Verbenaceae, roots, 20.2% w/w), Quercus infectoria G. Olivier (Fagaceae, fruits, 19.1% w/w), Berberis aristata DC.

(Berberidaceae, roots, 25.4% w/w), Cocos nucifera (Arecaceae, seeds, 19.9% w/w), Couroupita guianensis Aubl. (Lecythidaceae, roots, 16.9% w/w), Jasminum grandiflorum L. (Oleaceae, flowers, 17.3% w/w), Mucuna pruriens (L.) DC. (Fabaceae, seeds, 20.1% w/w), Symplocos racemosa Roxb. (Symplocaceae, barks, 19.5% w/w), Tectona grandis L. f. (Lamiaceae, roots, 17.7% w/w), Hibiscus syriacus L. (Malvaceae, roots, 18.4% w/w), Ammannia baccifera L. (Lythraceae, roots, 15.6% w/w), and Vitex trifolia L. (Lamiaceae, roots, 12.5% w/w). This research shown that only seven medicinal plants (Ammannia baccifera, Berberis aristata, Couroupita guianensis, Hibiscus syriacus, Mucuna pruriens, Quercus infectoria, Symplocos racemosa) inhibit the proliferation of Propionibacterium acnes.[70]

Eczema

A specific form of skin inflammation characterised by erythema (redness), oedema (swelling), and papules (bumps), subsequently leading to lichenification (thickening) and scaling of the skin. Eczema typically induces pruritus and a burning sensation on the skin. Eczema, or atopic dermatitis is a disorder characterised by inflamed, itchy, red, cracked, and rough patches of skin. Karodi et al. (2009) indicated that Rubia cordifolia L. (Rubiaceae) is renowned for its therapeutic use in eczema. This study assessed the wound healing efficacy of the alcohol extract and the R. cordifolia hydrogel using an excision wound model in mice. The mice were categorised into five groups of six individuals each, with groups I–V receiving gels containing varying extract concentrations (0.2%, 0.5%, 1%) once daily for 15 days.

Consequently, the effects of the gel on wound contractility, closure, surface reduction, tissue regeneration at the wound site, and histopathological characteristics were significant in the treated mice.[82] Mukhopadhyay et al. (2018) investigated Eclipta prostrata (L.) L. (= Eclipta alba (L.) Hassk.) which is also believed to aid in the treatment of eczema. The extract of E. prostrata shoots exhibited antibacterial properties against E. coli and Staphylococcus aureus, as well as anti-inflammatory effects in albino mice.[83] Priyadarshi and Ram (2018) documented Carica papaya L. (Caricaceae) as a remedy for eczema. This investigation demonstrated that the three extracts (n-hexane, ethyl acetate, and ethanol) of C. papaya shown considerable analgesic efficacy at all three dosage levels (0.175, 0.35, and 0.70 mg/kg bw orally) in comparison to aspirin (the standard medication) in a mouse model with acetic acid-induced pain.[84]

Psoriasis

Psoriasis is a persistent inflammatory dermatological condition characterised by the accumulation of cells that result in the formation of scales and pruritic, xerotic lesions, predominantly located on the scalp, elbows, knees, and lumbar region. It is an autoimmune disorder. Schafer et al. (2010) demonstrated that apremilast, an inhibitor utilised for psoriasis and psoriatic arthritis under the brand name Otezia, exhibits extensive anti-inflammatory properties by suppressing the production of various inflammatory mediators, including CXCL9, TNF-α, IFN-γ, CXCL10, IL-2, IL-12, IL-23, MIP-1α, MCP-1, and GM-CSF from PBMC. This study indicates that the reduction of IL-12, IL-23, and TNF-a production, along with apremilast's capacity to mitigate psoriasis lesions in vivo, shows that this agent may serve as an effective treatment for psoriasis via a complex mechanism.[85]

Schonthaler et al. (2009) examined the effects of systemic VEGF (vascular endothelial growth factor) suppression on the reduction of psoriasis-like dermatitis. In this study, RT-PCR analyses were conducted on the anti-VEGF-treated isolated mouse epidermis and on VEGF in double knockout (DKO) mice administered with IgG. RNA levels were significantly diminished , chemotactic proteins S100A8 (myeloid-related protein-8) and S100A9 (myeloid-related protein-14) [86]. RNA levels were markedly decreased in epidermal samples of mice treated with anti-VEGF.[86] Chen et al. (2017) established that Quercetin (QC) exhibits anti-psoriasis properties in imiquimod (IMQ) induced mice by modulating various signalling pathways, including the MAPK (Mitogen-activated protein kinase) pathway, the NF-κB pathway, and the Nrf-2 pathway. Consequently, QC holds considerable potential for psoriasis treatment and enhancing antioxidant and anti-inflammatory activity.[87]

Table 2: Pharmacological and preclinical proof.

Plant species and family name	Pharmacological activity	Extract/fractions/plant parts	*In-vitro*/*in-vivo*/*ex-vivo* assays/models	Reference
Symplocos racemosa Roxb. (Symplocaceae)	Antimicrobial activity	Ethanolic extract of bark	Disc diffusion method against *Propionibacterium acnes* and *Staphylococcus epidermidis*	70
Ammannia baccifera L. (Lythraceae)	Antimicrobial activity	Ethanolic extract of root	Disc diffusion method against *Propionibacterium acnes* and *Staphylococcus epidermidis*	70
Coccinia grandis (L.) Voigt (= *Coccinia indica* Wight and Arn.) (Cucurbitaceae)	Anti-inflammatory activity	Fruit juice powder	Carrageenin and histamine induced paw oedema	88
Azadirachta indica A. Juss. (Meliaceae)	Anti-inflammatory activity	Chloroform extract of stem bark	Carrageenin induced paw oedema in rat and mouse ear	32
Nelumbo nucifera Gaertn. (Nelumbonaceae)	Anti-inflammatory activity	Whole plant extract	Antimicrobial susceptibility assays	89
Citrus limon (L.) Osbeck (Rutaceae)	Anti-inflammatory activity	Methanol and aqueous Extract	Assay of DPPH scavenging activity	90
Aloe vera (L.) Burm.f. (Asphodelaceae)	Anti-inflammatory activity	Mehanolic extract (90%) and dichloromethane extract of stem	10% DMSO	91
Cissus quadrangularis L. (Vitaceae)	Anti-inflammatory activity	Alcoholic extract	*S. aureus, E. coli, P. aeruginosa*	91
Celosia argentea L. (Amaranthaceae)	Wound healing activity	Alcoholic extract of flowers	Rat burn wound	92
Centella asiatica (L.) Urb. (Apiaceae)	Wound healing activity			93

Table 3: Clinical evidence and confirmation in cellular research.

Plant species and family name	Extract/plant parts/fractions	Mode of action in human	Ref.
Calendula officinalis L. (Asteraceae)	Aqueous extract of flowers	Enhances the phagocytosis of human granulocytes, modulates the generation of neutrophil-derived reactive oxygen species (ROS) and reactive nitrogen species (RNS), particularly nitric oxide, while reducing pro-inflammatory markers such as TNF-α, IL-1β, IL-6, interferon gamma (IFN-γ), C-reactive protein (CRP), and cyclooxygenase-2 (COX-2).	1
	Aqueous extract of flowers, water fraction	Proliferation and migration of normal human dermal fibroblasts (HDF)	94
	Isolated calendula oil from calendula flowers	The SPF of sunscreen formulations is determined by the ratio of the minimal erythema dose (MED) of skin protected by sunscreen to the MED of exposed skin.	95
Centella asiatica (L.) Urb. (Apiaceae)	Ethanolic extract of whole plant	Human monolayer cell culture stimulates the Smad pathway, enhances	1

		collagen synthesis in human dermal fibroblasts, and influences the deposition of extracellular matrix proteins.	
Aloe vera (L.) Burm.f. (Asphodelaceae)	Ethanolic extract	Hyaluronic acid and dermatan sulphate in granulation tissue, along with fibroblast activity and proliferation, leads to a considerable increase in collagen synthesis. Glucomannan and gibberellin interact with growth factor receptors on fibroblasts.	1
	Ethanolic extract	Human colon carcinoma cell lines, human acute myeloid leukaemia cells	74
Phyllanthus emblica L. (Phyllanthaceae)	Aqueous extract of dried fruit	Chromium-induced oxidative damage is characterised by diminished GSH and GPx activity in macrophages, suppression of matrix metalloproteinase levels, specifically MMP-1, and hyaluronidase activities, as well as the enhancement of pro-collagen content. UV-B exposure induces skin photoaging in fibroblasts, as evidenced by MTT assay, alongside a significant upregulation of cytokine (IL-10) concentration and a marked reduction in cytokine (TNF-α and IL-1β) levels.	1
Terminalia chebula Retz. (Combretaceae)	Extract of fruits	Augments melatonin concentration in the pineal gland and cytokine levels, elevates antioxidant enzyme levels, GSH, and T and B cell concentrations.	1
Cullen corylifolium (L.) Medik. (= *Psoralea corylifolia* L.) (Fabaceae)	Aqueous extract	Increases melatonin levels in the pineal gland and cytokine concentrations, enhances antioxidant enzyme levels, glutathione (GSH), and T and B cell counts.	1
Curcuma longa L. (Zingiberaceae)	Extracts of rhizomes	H2O2-induced injury in human keratinocytes, fibroblasts, NG 108–15 cells, and human erythrocytes by the oxidation of oxyhemoglobin	96
Datura metel L. (Solanaceae)	Methanol extract of flowers	Human lung carcinoma cells and human colorectal adenocarcinoma cells	96
Calotropis gigantea (L.) Dryand. (Apocynaceae)	Extract of latex	Human fibrinogen, human blood specimen, human blood coagulum, and plasma coagulum	98
Ocimum tenuiflorum L. (= *Ocimum sanctum* L.) (Lamiaceae)	Ethanolic extract	Human keratinocyte cell lines, A549 lung cancer cells, human fibrosarcoma cells, cultured human lymphocytes	33
Hibiscus syriacus L. (Malvaceae)	Ethanolic cell culture extract	Induced production of fibronectin and collagen in human HaCaT keratinocytes and human dermal fibroblasts (HDF)	99

3. DISCUSSION

In India, multiple plant components are utilised to address dermatologic ailments: rhizomes, roots, stems, flowers, fruits, bark, seeds, seed oil, buds, latex, and entire plant parts. Preparation techniques and administration strategies vary considerably. Topical administration include intricate formulations such as decoctions, infusions, ointments, oils, poultices, tars, tinctures, unguents, or in a desiccated form (powder or ash).[100] This review contributes to the existing body of knowledge regarding contemporary home remedies employed for the treatment of skin problems in India. Most

conventional medicines were formulated utilising water as a medium. The administration strategy was primarily topical, localised to the diseased area, but sometimes included oral treatment in certain instances. An examination of the oral application of herbal remedies for ailments such as acne, carbuncles, leprosy, measles, urticaria, scabies, leucoderma, ringworm, and dry skin problems reveals that practitioners possess a comprehensive understanding of the disease's systemic progression. Alongside pure herbal formulations, the treatment was occasionally administered with milk, curd, ghee, coconut oil, or honey to augment its efficacy.[101] For instance, regarding acne,[102] indicated that aromatherapy, botanical components, and essential oils (plant extracts) are significant potential agents in acne treatment,[101] as corroborated by bioactivity studies, preliminary evidence, and small pilot clinical trials conducted outside of North America, primarily involving young adults. Sandalwood oil (Santalum album L., Santalaceae) is utilised in numerous Asian nations as a treatment for inflammation and skin eruptions due to its antibacterial efficacy against Staphylococcus aureus, S. epidermidis, and P. acnes at concentrations of 0.06% or lower. Sandalwood oil is a component in face gold massage cream and moisturiser cream in India (Table 5). Sandalwood oil products were mostly well accepted; nevertheless, the most frequently reported treatment-related symptoms included burning, dryness, and stinging.[101] In Europe, various native or widely cultivated plants are employed to combat acne, including stinging nettle leaves (Urtica dioica L., Urticaceae), walnut husk (Juglans regia L., Juglandaceae), myrtle leaves (Myrtus communis L., Myrtaceae), chamomile flowers (Matricaria chamomilla L., Asteraceae), and rose flowers (Rosa × damascena Herrm., Rosaceae). The two aforementioned plants are utilised in Indian dermatology (Table 5), since their herbal extracts shown significant antibacterial and anti-inflammatory properties in preliminary experiments, making the topical administration of these botanical extracts promising candidates for localised acne treatment.[103]

Certain Indian cosmetics enumerated (e.g., Antiacne cream, Active D pigmentation cream, or Anti-blemish gel) incorporate jojoba oil (Simmondsia chinensis (Link) C.K. Schneid., Simmondsiaceae), which possesses a substantial concentration of wax esters, rendering it an effective choice for the remediation of dermatoses characterised by a compromised skin barrier, including seborrhoea, eczema, atopic dermatitis (AD), and acne.[104]

Mediterranean flora may be combined with indigenous Indian species, such as Rosemary extract (Rosmarinus officinalis L., Lamiaceae), which is an ingredient in the Face Gold massage lotion (Table 5). The incorporation of rosemary extract may exhibit anti-inflammatory properties in cosmeceutical or dermatological formulations, as evidenced by its injection, which does not provoke skin irritation or inflammation in mice.[101] Due to these characteristics, Rosemary is cultivated in numerous locations worldwide.

Additional extensive ethnobotanical and ethnopharmacological studies could enhance the advancement of medicinal plants for dermatological applications and therapies.[37] India presents significant opportunities for ethnobotanical study on dermatological conditions, attributable to its diverse flora and the longstanding tradition of medicinal practices which provides extensive experience in the use of these therapies.

Natural plant oils are extensively utilised globally for dermatological care (as topical treatment) due to their general accessibility and cost-effectiveness. Numerous natural oils possess distinct constituents with antibacterial, anti-inflammatory, antioxidant, and anti-pruritic activities, rendering them a viable and appealing adjunct to the management of xerotic and inflammatory dermatoses associated with skin barrier dysfunctions.[20] Topically applied plant oils may exert varying effects on the skin based on their composition and the skin's pathophysiological characteristics.[104] Alongside the aforementioned olive oil (Olea europaea L., Oleaceae), Indian medicine frequently

employs other plant oils such as sunflower seed oil (Helianthus annuus L., Asteraceae) in anti-acne and moisturiser creams (Table 5). Natural oils, like sunflower and sesame seed oil (Sesamum indicum L., Pedaliaceae), are proposed as effective options for enhancing skin barrier homeostasis. In traditional Taiwanese medicine, sesame oil is utilised to alleviate inflammatory joint and wound discomfort and has demonstrated chemopreventive properties in a two-step carcinogenesis mouse skin cancer model.[104] In Ayurvedic Medicine, olive oil is a component of Divya Kayakalpa Taila, which targets skin ailments such as ringworm, pruritus, sunburn, eczema, leucoderma, psoriasis, urticaria, and allergies. Vipadikahara ghrita taila is utilised for skin blemishes and also contains sesame oil. In Ayurvedic Medicine, it has been determined that excessive consumption of sesame seeds is a cause of persistent skin conditions.[17] All of these components are beneficial for skin therapy. However, the paramount Ayurvedic consideration is to address doshic imbalances and subsequently understand how to rectify such discrepancies. According to aromatherapeutic literature, [105] plant-based carrier oils recommended for skin care are also utilised in Indian ethnodermatology (Table 1, Table 2, Table 3) and are derived from the following plant species: Aloe vera (L.) Burm.f. (Asphodelaceae), Calendula officinalis L. (Asteraceae), Cocos nucifera L. (Arecaceae), Helianthus annuus L. (Asteraceae), Macadamia ternifolia F. Muell. (Proteaceae), Prunus dulcis (Mill.) D.A.Webb (= Prunus amygdalus var. dulcis (Borkh. ex DC.) Koehne) (Rosaceae), Simmondsia chinensis (Link) C.K. Schneid. (Simmondsiaceae), Triticum vulgare Vill. (Poaceae), Vitis vinifera L. (Vitaceae). V. vinifera L. is utilised in Ayurvedic formulations like Chyawanprash, which promotes wound closure.[104] Consequently, it is also incorporated in Face Gold massage cream, anti-acne cream, anti-blemish gel, and moisturiser cream. The direct topical application of grape seed oil on human skin remains inadequately studied; nonetheless, resveratrol exhibits a direct antibacterial activity against pathogens like Enterococcus faecalis, Pseudomonas aeruginosa, and Staphylococcus aureus.[104]

The ethanol extract of Cocos nucifera L. (Arecaceae) did not demonstrate antimicrobial activity against Propionibacterium acnes and Staphylococcus epidermidis.[70] However, the topical application of virgin coconut oil is effective in enhancing wound healing by accelerating epithelization which is also significant in acne treatment.[104] Furthermore in veterinary dermatology, research indicates that a topical spray comprising essential plant oils, fatty acids, and antimicrobial compounds (such as Manuka oil) may expedite the resolution of pyoderma and reduce the duration of antibacterial therapy.[106]

Traditional medicine is a viable alternative therapeutic approach that can be employed in oral and/or topical forms against numerous dermatological problems. It underscores the importance of both monoherbal and polyherbal formulations in the management of dermatological conditions. A plethora of investigations has been conducted to illustrate the diverse application of traditional medicines in treating various skin disorders. This knowledge may be deemed beneficial for Western dermatologists to utilise these therapies as alternative or auxiliary treatment options. This review aims to give ethnodermatological evidence from India, including their efficacy, production procedures, and administration techniques. Nevertheless, scant research exists addressing the safety concerns related to potential contamination of the utilised formulations. Furthermore, more comprehensive clinical placebo-controlled investigations are required to enhance comprehension, systematic analysis, and implications of traditional dermatological uses in humans.

However, it should be remembered that in Ayurvedic medicine there is no need to use preset formulations. There is no tailoring to each individual or looking at different individual nuances for each disease. Moreover, some evidence in

Ayurvedic medicine is still only supported by in vitro testing and in vitro evidence does not always successfully extend into the clinical realm. Therefore, extensive clinical studies are still required for most of these candidate plant extracts.

4. CONCLUSION

This review indicates that local populations utilise their knowledge of herbal medicine to address various human skin problems. In the Indian subcontinent, alternative therapy for dermatological issues and treatment is the primary choice for millions. This overview of ethnobotanical dermatology in India substantiates the notion that their examination will expedite the identification of novel efficacious medicinal agents for skin disorders. Currently, ethnodermatology is a well recognised global discipline with numerous novel approaches implemented across various countries. The subject is of critical importance, as numerous skin ailments are purportedly addressed by traditional medicines in conjunction with Western treatments or as alternatives. Significant data substantiates the effectiveness of traditional formulations however, the associated safety concerns must also be acknowledged while utilising these treatments. We anticipate that this article will expedite the advancement of this field to discover a new generation of natural human skin therapies that will address the increasing customer need for safe, sustainable, and natural solutions. In this context, research on plants employed in ethnodermatology in India and beyond should be intensified, necessitating further systematic and rigorous investigations for the analysis and testing of traditional dermatological preparations that may ultimately lead to the formulation of novel therapeutics for skin disorders.

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