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A Review on Herbal Arsenals in the treatment of Skin Diseases

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Abstract:

Skin diseases are numerous and a frequently occurring health problem that affects people of all ages from newborns to the elderly and causes harm aesthetically and medically. Maintaining healthy skin is important for a healthy body. Skin, being the largest and most unprotected organ of the body, is relentlessly subjected to various environmental pollutants like chemicals, UV radiations, colours, dyes, hydrocarbons, and volatile compounds. Many people suffers from skin diseases affecting the skin, like psoriasis, herpes, cancer and cellulitis. This exposure increases skin sensitivity, which often manifests as allergic reactions, pruritus, acnes and blisters leading to atopic dermatitis, inflammation, excessive dryness, boils, and infections. Compounding the issue, the antibiotic resistance complicates the skin treatment conditions, necessitating alternate therapeutic approaches. Age old traditional practices and knowledge imparts the use of natural plants and herbs demonstrating efficacy in treating skin allergies and inflammation at various stages. The use raw plant parts as paste or decoction or its isolated bioactive molecules work by modulating the host's immune response, reducing inflammation and reactive radicals thereby promoting healing. These wild plants with natural remedies are widely available, with no side reactions and claimed to be safe. For safe alternative and to reduce the effect of chemical drugs, natural plants should be utilized more for sustainable solutions. Thus more confirmed research data and knowledge is needed for the effective treatments of skin allergies and related infections by harnessing their therapeutic potentials. This review article deals with bountiful of herbs and plants with their relatedness for treating skin associated diseases.

Keywords: *Skin Diseases, Allergies, Bioactive Molecules, Plant Parts.*

1. Introduction:

Human skin, comprises the outer body covering and first mark of defense. Though it is divided into three main layers (epidermis, dermis, and hypodermis), each layer has distinctive role and function. The epidermis, being the outmost layer bears maximum skin abrasions whereas dermis lying below, is attached to hypodermis, the beneath layer under dermis. The innermost payers are innervated and attached to the connective tissues [1]. Different types of diseases occur on skin like rashes, microbial and fungal infections, parasitic infections and UV radiation induced ailments [37;43]. Apart from these concerns, immune

mediated conditions also create major setbacks to the skin. For example, Psoriasis is a chronic skin disease where the skin becomes red, flaky and itches. The underlying cause being hyperactive immune system and the result is too much multiplication of the skin near elbows, knees or scalp [9]. Atopic dermatitis or Eczema, is again an immune intervened inflammatory condition of the skin that makes skin itchy and dry, common in children. Moreover change in the lifestyle pattern and exposure to various pollutants influences the microbial composition of the skin and thereafter affects immune homeostasis [10;6;44]. The native microbial population of the skin becomes opportunistic and thereby affects immune soldiers like the T cell, B cell, macrophages, dendritic cells and natural killer cells. They communicate with the epithelial cells of the skin and trigger inflammatory response [6;42].

Several traditional Indian literatures and Unani texts emphasized on the phytochemical constituents of arsenal of plants in treatment of various diseases. As long as the history of mankind goes, practitioners are using different plant parts like roots, leaves, flowers in various forms of decoction or paste for remedy from diseases. Citing the example of Asoka tree, its bark flower and roots have therapeutic properties used to treat uterine problems, dysentery, skin related diseases and others [7;16;28;37]. *Clitorea ternatea*, *Calendula officinalis,* Chamoline, *Portulaca* and even tomato plant exhibit potential in inhibiting the growth of some common skin microbes and pacify several skin problems [29;33;32;15]. Addressing skin allergies and inflammation, the officinal plants parts are rich sources of bioactive molecules which can aid in reducing allergy symptoms, repair skin damage issues and reducing skin inflammation. According to [14], some of these bioactive molecules act as antihistamines and specific inhibitors of certain receptor channels, and help in improving skin conditions. These molecules can help alleviate symptoms and potentially offer alternative treatments that are less reliant on antibiotics. By triggering the immune system and pacifying inflammation, these natural compounds offer a holistic approach to manage skin conditions [34]. Exploring, identifying and isolating the b13ioactive molecules present in these plants, researchers can potentially develop new treatments for management of skin allergies and related infections which could be both operative and sustainable.

1.1 Portulaca oleraceae (Purslane)

The herbaceous plant comes from the Portulacaceae family. This herb has inherent cooling properties that calm the skin and provides relief from skin irritation and rashes during high heat. Reports of [21] on experimental mice model depicts reinstate of skin barrier integrity when the herbal extract was applied externally. Further, the immune pathway was modulated by inactivation of T-lymphocytes through restraining the antigen presenting cells (APC) and deploying anti-inflammatory effects. Different concoctions are made from its leaves and root extracts to treat burns and skin lesions such as boils and carbuncles. According to [39] chronic eczema is weakened by applying *P. oleraceae* extracts which controlled inflammation mediated molecules and yielded antioxidant properties. Thus *Portulaca* holds a promising natural remedy for management of skin allergies. Antibacterial and antifungal activities are also revealed by the aqueous extract of the leaves when applied topically [20].

1.2 Calendula officinalis (Marigold)

Calendula officinalis is a popular annual herb of Asteraceae family originates from the Mediterranean region with high significance in religious and ceremonial practices. Bioactive compounds like triterpenoids, flavonoids possess anti-inflammatory and antimicrobial properties. Flavonol 3-O-glycosides extracted from *Calendula* flowers have been found to inhibit inflammation-causing enzymes, such as lipoxygenase, which impact atopic dermatitis [40]. Available commercially in the form of creams, tinctures and oils, are highly effective in soothing inflammation [11]. Topical formulations of marigold extract in gel formulations, assessed against UV-B radiation-induced mice, showed initiation of collagen synthesis especially in the sub-

epidermal connective tissues. The gel formulations comprise narcissin (0.21µg/cm) and rutin (0.07µg/cm) which has antiseptic role in treatment of skin eczema. Flavonoids and carotenoids found in marigold extracts possess anti-inflammatory activity and the butanoic fraction contains components with antioxidant properties and radical scavenging power [29]. It is also speculated that since Carotenoids are the originators of vitamin A biosynthesis, hence along with its manganese cofactor combats inflammation. During inflammation, reactive oxygen species (ROS) are increased and removed from the body through a fine tuning by the antioxidant compounds. Disproportions between these molecules cause the inflammation to progress [12]. Skin inhabiting bacteria like *Staphylococcus aureus* sometimes becomes opportunistic and cause bacterial infection of the skin. In this regard, *Calendul*a extracts possess antimicrobial effect against *S. aureus* and *Enterococcus faecalis* and prevents any infection [29].

1.3 Sarco asoca (Ashoka)

The medicinal plant belongs to Caesalpinaceae family with wide array of applications in management of diseases. The paste of its roots is useful in acne, ulcers, external inflammation and skin diseases. It is used for treating itching in psoriasis, dermatitis and eczema by rubbing the crushed flower paste on the surface layer of the skin. A study revealed that pretreatment with the flavonoid fraction of *S. asoca* was a significant reduction in the number of tumors in the experimental mouse. Moreover, pretreatment with *S. asoca* deferred the latency period before the appearance of the tumor. In case of skin cancer, a significant decrease in the expression of a marker molecule like ornithine decarboxylase, was observed in the experimental group where flavonoids from *S. asoca* was used to treat carcinogenesis of the skin [7;37].

1.4 Matricaria chamomile (Chamomile)

The herb with beautiful white flowers comes from the Asteraceae family. The flowers mainly have therapeutic role as antioxidants and also helps in skin cell restoration. Terpenoids and flavonoids are present abundantly in the flower but the main bioactive molecule against psoriasis is chamazulene, formed from matricin as by-product. The chamomile flowers contain volatile oils which includes matricin among others that possess anti-inflammatory properties. The prevention of inflammation is exhibited by inhibition of the enzyme lipoxygenase, which leads to reduced formation of leukotriene B4, produced exorbitantly in psoriasis plaques [32;31]. Antimicrobial activity of Chamomile oil against common skin pathogens like *Staphylococcus aureus* and *Candida* sp. is seen. The flavonoids, like quercetin can diffuse through the skin and show anti-enzymatic activity against lipoxygenase [32].

1.5 Mirabilis Jalapa (Four o'clock flower, Marvel of Peru)

M. jalapa (family Nyctaginaceae), an ornamental plant popular throughout the tropics, is traditionally used in allergic skin disorders and asthma. Atopic dermatitis, a form of skin disorder culminates from inflammatory responses triggered by eosinophils. According to traditional literatures, the plant roots bear properties which are antagonistic to histamine receptors or prevent release of histamine from mast cells, thus preventing allergic skin disorders [22]. This plant contains various phytochemicals and some have been isolated from its parts, such as carbohydrates, glycosides, alkaloids, flavonoids, phytosterols (beta-sitosterol and stigmasterol), ursolic acid, oleanolic acid, trigonelline [22].

1.6 Camellia sinensis (Tea)

Green tea belongs to the tea plant, *C. sinensis* of Theaceae family and is a rich source of bioactive components like polyphenols and flavanols like catechins. Green tea is highly rich in epigallocatechin gallate (EGCG) may play an important role in treatment of skin tumours. The polyphenols act as antioxidants in the body scavenging harmful radicals starting from the stratum corneum layer. The deepest layer of the skin is

also protected from ultraviolet radiations due to these actions of polyphenols. Various enzymes like lipoxygenase, hyaluronidase and collagenase, which have a destructive effect on are inhibited by the polyphenols [18]. Thus they display anti-inflammatory activities, mends skin microcirculation and the binding components of the skin. Inflammation causing molecules like prostaglandins, nitric oxides, leukotrienes, are observed to reduce in their production upon using tea extracts [18]. Even another form of *C. sinensis* (White tea) has shielding effect from UV damages on the skin due to its antioxidant properties and protects skin against sunburn [19].

1.7 Cannabis sativa (Marijuana, Hemp)

C. sativa belongs to the Cannabinaceae family and recently in the limelight for its therapeutic applications to treat several diseases of the skin like eczema, psoriasis and cancer owed to the bioactive compound called cannabinoids. Different forms of the plant like powdered leaves and flowers, resin, hash oil, and various solvent extracts are used in formulations while applying on affected area. From long time *Cannabis* powdered leaves are used to dress wounded surfaces and give relief to itchy skin areas. The derived oil was used to treat various skin conditions and protect skin from fungal, bacterial, and viral infections. Endocannabinoids, belonging to the cannabinoids group are endogenously present in human systems. They have G-protein coupled receptors on the skin surface through which cannabinoids affect skin proliferation and growth. Dis-regulation in the receptor or enzymatic Endocannabinoids synthesis pathway leads to various skin problems [38;30]. Relevant research studies have demonstrated that link exists between cannabinoids receptors and diseased condition of the skin like allergies, acne, pruritus, atopic dermatitis and psoriasis [41].

1.8 Crocus sativus (Saffron)

Generally known as Saffron, the widely popular herbaceous plant belongs to the Iridaceae family. Crocin and Saffranal are the active constituents obtained from flower stigma which scavenges the free radical generated in the body [4]. The methanol extracts of these components have the ability to donate hydrogen ion to DPPH radical and acts as a good anti oxidizing agent. The chemo preventive property of saffron acts as anti-inflammatory component and has prevented the formation of skin papillomas in animal models studied in an experiment conducted by [8]. It is used in various sun screen lotions as UV protection agent and thus prevent skin from sunburn. It prevents skin rashes and used with basil leaves or coconut oil helps in improved circulation of skin and removes skin acnes. It has also been found useful in the treatment of psoriasis [5;25].

1.9 Azadirachta indica (Neem)

The miracle tree of the Meliaceae family has panacea of ingredients to treat various ailments. The leaves, flower, bark, in the form of paste, oil, gel, powder are used to treat psoriasis, pruritus, dermatophytosis, skin ulcers, blisters and many types of diseases The bioactive molecule especially to treat skin disease are the Nimbolide and Nimbidin which suppressed inflammation and Reactive Oxygen Species (ROS) in rats [13]. The nimbolide fraction isolated from leaves and fruits are effective against psoriasis. Azadirachtin and nimbolide are active ingredients in Neem which acts as scavengers of free radicals due to their antioxidant possessions. Neem active ingredients specially found in neem seed oil, also suppresses inflammation by regulating pathways of proinflammatory enzymes like lipoxygenase [26;3]. Several studies also revealed that solvent extracts of neem leaves had inhibitory property against biofilms forming methicillin resistant *Staphylococcus aureus* and *Pseudomonas aeruginosa*, respectively which are found commonly in skin wound infections [13].

2. Conclusion

Rising problems of skin associated diseases needs an urgent attention which can only be pacified by augmenting research in the field of medicinal plants. Isolation of bioactive compounds, identifying their target molecules and associating with various other plants can help in the treatment of skin diseases. Thus herbal medicine presents a promising, sustainable and holistic approach to manage skin diseases. Bridging traditional knowledge with modern scientific validation can unlock the full potential of these natural arsenals, offering safer and more accessible therapeutic options.

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