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A review of four common medicinal plants used to treat eczema

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Many medicinal plants are commonly used to treat skin diseases such as eczema, psoriasis, vitiligo, cellulitis, herpes and cancer. Herbal medicine is as old as civilization. Application of traditional herbal medicine is widespread in different regions of the world. It is more common in villages and desert areas where medical services are less accessible. Herbal treatments are generally perceived as effective and have few side effects. Research on herbal drugs in terms of controlled clinical trials in humans is still limited. Herbal clinical research optimistically opens new therapeutic avenues. Eczema is considered as a group of medical conditions that cause the skin to become inflamed or irritated. The treatment of eczema is complicated. Moreover, screening is essential to reduce any potentially harmful side effects on human skin and health. This review summarizes the published literature on four common medicinal plants, namely, aloe (*Aloe vera*), oat (*Avena sativa*), turmeric (*Curcuma longa*) and chamomile (*Matricaria chamomilla*) used for the treatment of eczema. The mechanism of action, therapeutic indications and side effects of these plants are described.

Key words: Medicinal plants, treatment, skin diseases, eczema.

INTRODUCTION

Many medicinal plant species worldwide are used in traditional medicine for treating different diseases. The world health organization (WHO) has estimated that about 80% of the population living in the developing countries depends tremendously on traditional medicine for their primary health needs. More than half of the world's population still depends exclusively on medicinal plants, and plants offer the active ingredients of most traditional medical products (Kumar and Navaratnam,

2013). Human skin is the largest organ in the body. It forms the first guard line. Its three main layers are epidermis, dermis and hypodermis (subcutaneous tissue). Each layer offers a distinctive role in the homeostasis of the skin. They vary in thickness throughout the body and from person-to-person (Tabassum and Hamdani, 2014).

Cutaneous inflammation is aggravated by pathogens, noxious mechanical and chemical agents, and immune/

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autoimmune responses. It is a complicated process during which the body repairs tissue damage and protects itself against harmful stimuli. Inflammation is distinguished by symptoms such as redness, swelling, itching, heat and pain (Ikeda et al., 2008). Under the effect of an inflammatory factor, some intracellular biochemicals are released from cells. Monocytes and macrophages produce cytokines. Their basic function in inflammatory processes is to activate cells engaged in the inflammation (neutrophils, macrophages, and mast cells), allow communication between them, provoke the prostaglandin synthesis and affect the synthesis of the C-reactive proteins. Among cytokines one can differentiate pro-inflammatory (interleukins IL-1, IL-6, IL-8, IL-17, IL-18, α and β interferon, and TNF) from anti-inflammatory ones (for example, IL-4, IL-10, IL-13). Prevalence of the first type leads to the systemic inflammatory reaction while prevalence of anti-inflammatory cytokines results in the anti-inflammatory response (Karpel, 2001). Chronic inflammatory diseases appear as a response to the disorders of inflammatory processes and excessive production of pro-inflammatory mediators such as IL-1 β , IL-6 and TNF- α initiating an inflammatory reaction cascade. Furthermore, in skin inflammatory diseases one may notice biosynthesis disturbance of eicosanoids in epidermis and instability of the neuroimmunological system in the skin, that is increased production of neurological mediators like P substance which stimulates nitrogen oxide synthesis (Aries et al., 2003; European Medicines Agency (EMA), 2008).

One of the inflammation-based diseases is atopic dermatitis (atopic eczema), which is a chronic disease affecting people genetically tended to overreact to external factors. It is commonly found in association with allergic rhinitis, asthma, or other manifestations of atopy. Atopic dermatitis is a widespread dermatologic disease in children. The most commonly observed manifestations of atopic dermatitis are extreme skin dryness and itching, redness, scaly patches, and thickened lichenified plaques with excoriation. *Staphylococcus aureus* is being noticed to inhabit skin. Secondary impetiginization, with honey-colored crust, is general in infants. Atopic dermatitis origin is complicated. It is claimed that during the onset and in the course of the disease, the most significant are genetic factors and the effect of the external environment (Tay et al., 2002; Worm, 2002; Teplitsky et al., 2008). An immunological mechanism which participates in the pathogenesis of the atopic dermatitis and other skin diseases of the inflammatory origin is linked to activation of T lymphocytes and it is a result of complicated interactions of different cells: keratinocytes, endothelium cells, eosinophils, Langerhans cells and T lymphocytes, and many cytokines and mediators. In atopic skin diseases, skin cells generate interleukins initiating inflammatory reactions (Aries et al., 1999). In patients, great production of specific antigens IgE against low amounts of food and inhalant allergens, which are

responsible for inflammation development, is noticed. Due to releasing the leukotrienes, prostaglandins and proteases, inflammation symptoms happen in different organs and systems. Extreme skin dryness, characteristic of atopic dermatitis, is linked to activity change of Δ 6-desaturase – an enzyme catalyzing transformation of the linolenic acid into the γ -linolenic one.

Patients affected with this disease exhibit a low level of essential fatty acids (EFA) and disorder of lipid production in epidermis, which are of importance during formation and persistence of dermal changes. In patients suffering from atopic dermatitis, an elevated value of trans epidermal water loss (TEWL) is noted in dry skin areas and not affected by inflammation, and in the clinically healthy skin, which may be linked to a lowered concentration of lipids in skin, particularly that of ceramides, and the loss of ingredients of a natural moisturizing factor (NMF) (Murata et al., 1996; Schürer, 2002; Pytkowska, 2003). In atopic dermatitis treatment, plant substances with anti-inflammatory activities and the ability to regulate the synthesis of lipids in epidermis would be employed.

The paper of Pan et al. (2014) offers a review of the history and status quo of Chinese, Indian, and Arabic herbal medicines regarding their significant contribution to the health promotion in the present-day over-populated and aging societies. Medicinal plants have been used for centuries all over the world, and many people still depend on indigenous medicinal plants for their primary health care requirements. Several researchers including Rahman et al. (2004), El-Ghazali et al. (2010) and Daur (2012) have demonstrated that Saudi Arabia has valuable medicinal plants and its natural stress conditions of drought and heat are considered as positive factors for medicinal plants. Many herbs are used to treat various skin diseases including eczema (Khiljee et al., 2011; Zari, 2012; Dawid-Pač, 2013; Tabassum and Hamdani, 2014; Radha and Laxmipriya, 2015). In this review, we summarize the scientific data published on four common medicinal plants, namely, *Aloe vera*, *Avena sativa*, *Curcuma longa* and *Matricaria chamomilla* used for the treatment of eczema. The results of different studies on each plant, possible mechanism of action, their chemical composition and toxicity data have been presented.

METHODOLOGY

There are many medicinal plants used to treat eczema, however, we selected in this review four common medicinal plants, namely, aloe (*A. vera*), oat (*A. sativa*), turmeric (*C. longa*) and chamomile (*M. chamomilla*) used for the treatment of eczema. These plants were chosen for this study based on: first, previous literature reviews and second, ethnobotanical information. In addition, it seems that these four plants are relatively more effective in treating eczema and have minimal side effects compared to most other plants. The current review was achieved using an organized search of the scientific data published on four medicinal plants used for the treatment of eczema. The searches were carried out using various



Figure 1. *Aloe vera*.

databases, including PubMed (http://www.ncbi.nlm.nih.gov/pubmed), Science Direct (http://www.sciencedirect.com/), Scopus (http://www.scopus.com/), and Google Scholar (http://www.scholar.google.com/).

ALOE VERA (COMMON NAME: BARBADOS ALOE; FAMILY: XANTHORRHOACEAE)

Aloe vera L. (*Aloe barbadensis*) – *Aloe barbadensis* Mill. syn. *A. vera* (L.) Burm. f. (Barbados aloe, cape aloe) is known in Saudi Arabia as 'Sabar'. It is a perennial plant. It is commonly found in arid climate areas (Figure 1). It is native to Africa but it has been commonly cultivated throughout the world. Naturalised stands of the species occur in the southern half of the Arabian Peninsula, through North Africa, as well as Sudan and neighbouring countries. It is widely naturalized elsewhere (Akinyele and Odiyi, 2007) and large-scale agricultural production is undertaken in different countries to supply the cosmetics industry with *A. vera* gel. It is a stemless succulent plant growing up to 60 to 100 cm tall. Its flowers are produced in summer and are pendulous with yellow tubular corolla, 2 to 3 cm long (Yates, 2002; McLeod, 2002). It is juicy with bright yellow tubular flowers and thick and fleshy, 30 to 50 cm long, pea-green leaves. The leaf edge is serrated and spiky (World Health Organization, 1999). Its various phytochemicals have different biological properties that help to improve health and prevent disease conditions. It is one of the richest natural sources of health for human beings coming. Its chemistry has revealed the presence of more than 200 different biologically active substances. Many biological properties linked with *Aloe* species are contributed by the inner gel of the leaves. The genus *Aloe* has more than 400 species but few, such as *A. vera*, *Aloe ferox*, and *Aloe arborescens*, are worldwide used for trade (Radha and Laxmipriya, 2015).

A. vera has antiinflammatory, antioxidant, antimicrobial, anticancer, immune boosting and hypoglycemic properties. It is used traditionally to treat many diseases. It is applied externally for wound healing, soothing inflamed skin and psoriasis (Vogler and Ernst, 1999). It is also used internally (Eshun and He, 2004) for relief of heart burns and indigestion (Langmead et al., 2004), liver disease like hepatitis (Bottenberg et al., 2007), and diabetes

mellitus (Bunyapraphatsara et al., 1996). *A. vera* extracts possess antifungal and antibacterial activities (Ferro et al., 2003). Its gel is applied directly to the eczematous skin. Because of its moisturizing effect, the skin becomes softer and wounds heal rapidly. Many patients reported decrease of the symptoms of eczema such as skin dryness, scaling and improved skin quality. In addition, its antibacterial activities prevent secondary infection. In a randomized, double-blind clinical study by Syed et al. (1996). *A. vera* cream was compared with the placebo in 60 patients having mild to moderate chronic psoriasis. The cure rate was 83% with *A. vera* cream as compared to 7% with placebo.

A. vera is used in traditional medicine as a multipurpose skin treatment such as in Ayurvedic medicine Quattrocchi (2012). Early records of *A. vera* use appear in the Ebers Papyrus from the 16th century BC, and in Dioscorides' *De Materia Medica* and Pliny the Elder's *Natural History* - both written in the mid-first century AD (Barcroft and Myskja, 2003). It is also written of in the *Juliana Anicia Codex* of 512 AD (Reynolds, 2004). It is used generally in the traditional herbal medicine of many countries (Boudreau and Beland, 2006). Records have been found dating back over two thousand years listing *A. vera* as a skin treatment for eczema. Research has revealed that it contains a wound healing and anti-inflammatory property (Subramanian et al., 2006) which is why it is considered to be effective on eczema.

Many active ingredients including aloesin, aloemodin, acemannan, aloeride, methylchromones, flavonoids, saponin, amino acids, vitamins, and minerals have been identified from inner gel of leaves. Active ingredients in fresh aloe leaves are also carbohydrates (mannose-6-phosphate, acemannan - acetylated-1,4 polymer of mannose), glycoproteins, sterols (lupeol, β -sitosterol) and enzymes (bradykinase). Gel is prepared from fresh leaves and it is an antranoil-free preparation (Schulz et al., 2004; Choi et al., 2001; Femenia et al., 1999). *A. vera* leaves have also phytochemicals such as polymannans, anthraquinone C-glycosides, anthrones, other anthraquinones, such as emodin, and various lectins (Eshun and He, 2004; Boudreau and Beland, 2006).

Fresh aloe gel considerably reduced acute inflammation in rats (carrageenin-induced paw oedema), though no effect on chronic inflammation was noticed. Enzymes, carbohydrates and sterols contribute to anti-inflammatory activity of the aloe gel. Bradykinase inhibited thromboxane B₂ and prostaglandin F₂ activity *in vitro*, and mannose-6-phosphate, acemannan and sterols (mainly lupeol) decreased inflammation induced experimentally *in vivo* (Choi et al., 2003; Jia et al., 2008). Its gel is used for external treatment of minor wounds and inflammatory skin disorders, minor skin irritations including burns, bruises and abrasions. The application of freshly prepared gel is recommended because of its sensitivity to enzymatic, oxidative or microbial degradation. The gel possesses characteristics that are harmful to certain bacteria and fungi. A cream containing 0.5% aloe for 4 weeks lessened the skin "plaques" linked with psoriasis (Syed et al., 1996). Gel application assisted in the improvement of partial thickness burns (Kaufman et al., 1988). When the gel is applied to the skin, it appears to aid the skin to survive frostbite injury (Miller and Koltai, 1995). It may delay skin damage appearance during and after radiation treatment (Olsen et al., 2001).

A. vera has demonstrated great results in skin diseases and it is frequently taken as a health drink (Tabassum and Hamdani, 2014). Furthermore, it has been found effective in the treatment of wrinkles, stretch marks and pigmentations. It also appears to speed wound healing by improving blood circulation and stopping cell death around the wound. The effects of *Scutellariae radix* and *A. vera* gel on spontaneous atopic dermatitis (AD)-like skin lesions in mice were investigated. The results showed that the group receiving only *A. vera* gel in a dose of 0.8 mg/kg p.o gave relief in AD due to decrease of interleukin (IL)-5 and IL-10 levels (Kim et al., 2010).

A. vera extracts are generally used in the cosmetics and



Figure 2. *Avena sativa*.

alternative medicine industries, being marketed as variously having rejuvenating, healing, or soothing properties. However, there is insufficient scientific evidence of the efficiency or safety of *A. vera* extracts for either cosmetic or medicinal purposes, and what positive evidence is available (Boudreau and Beland, 2006) is frequently contradicted by other studies (Vogler and Ernst, 1999; Ernst, 2000). *A. vera* has possible toxicity, with side effects occurring at some dose levels either when ingested or applied topically. Oral ingestion of *A. vera* might cause diarrhea, while topical application may induce contact dermatitis, erythema, or phototoxicity (Boudreau et al., 2013). Cases of contact allergy have been seldom reported (WHO, 1999).

AVENA SATIVA L. (COMMON NAME: OAT; FAMILY: POACEAE)

It is native to the warm Mediterranean region. It is an annual plant. *A. sativa* is known in Saudi Arabia as 'Shofan' (Figure 2). Oat is cultivated in Europe, North America and Asia for its yield of grain. It has a distinctive inflorescence - a composite panicle, unlike wheat, rye and barley (Blumenthal et al., 2000). Active components of oat fruit are mucilage polysaccharides (β -glucan), proteins (glutelin and avenin), and flavonoids (European Medicines Agency (EMA), 2008). It has been used as a relaxing herb for a long time in order to alleviate itching and irritation. Oats have compounds called avenanthramides, which are powerful anti-inflammatory agents and also display anti-oxidant activity (Sur et al., 2008). Oats are commonly considered "healthy", or a health food, being advertised as nutritious. The established property of their cholesterol-lowering effects has led to acceptance of oats as a health food (Whitehead et al., 2014). Oat grass has been used traditionally for medicinal purposes, including to help balance the menstrual cycle, treat dysmenorrhoea and for osteoporosis and urinary tract infections (Duke, 2002).

Different clinical studies have been undertaken to investigate the effect of oats on eczema and these have all showed a significant decrease in skin redness, dryness, scaliness, itching and erythema after application of oat extracts. These results were observed in adults and children (Nebus et al., 2012). *In vitro*, a colloidal oat extract demonstrated anti-inflammatory activity – inhibited releasing of the arachidonic acid from phospholipids and the subsequent metabolism into prostaglandin and leukotrienes. In addition, it inhibited the expression of phospholipase A_2 (PLA₂) and cyclooxygenase (COX-2) (Aries et al., 2003). A colloidal oat extract stimulated production of the anti-inflammatory transforming growth factor β 1 (TGF β 1) by keratinocytes, and inhibited production of interleukins (Aries et al., 1999). About 20 and 30% colloidal extracts



Figure 3. *Curcuma longa*.

of oat (in petrolatum), under occlusion for 2 h, protected the skin from irritation induced by sodium lauryl sulfate which caused skin redness and increased the cutaneous blood flow (improvement of both parameters was noticed) (European Medicines Agency, 2008). Colloidal oatmeal was used to treat 11 patients with drug – induced skin rash. Out of 10 patients evaluated, 6 demonstrated a complete response and 4 a partial response, with no toxic effects noticed (EMA, 2008).

A. fructus is a traditional, herbal medicinal product used to treat minor skin inflammations such as sunburn, and it is used as an aid in the healing of minor wounds. Skin reactions may happen in atopic patients and in patients with contact dermatitis (EMA, 2008). Oat straw comprises polysaccharides (β -glucan) and silicon dioxide in a soluble form – as esters of the silicic acid with polyphenols, and monosaccharides and oligosaccharides. β -Glucan stimulates immune functions *in vitro* and *in vivo*. Silicon controls skin and subcutaneous metabolic processes. Oat straw is applied for inflammatory and seborrheic skin diseases; particularly those that come with itching (Blumenthal et al., 2000; Weiss and Fintelmann, 2000).

Oat in colloidal form is a centuries-old topical treatment for different skin conditions, including skin rashes, erythema, burns, itch and eczema but few studies have examined the precise mechanism of action for the anti-inflammatory activity of colloidal oatmeal. Colloidal oatmeal extracts diminished pro-inflammatory cytokines *in vitro* and the colloidal oat skin protectant lotion demonstrated significant clinical improvements in skin dryness, scaling, roughness, and itch intensity. These results reveal that colloidal oat extracts display direct anti-oxidant and anti-inflammatory activities, which may provide the mechanisms for observed dermatological benefits while using the colloidal oatmeal skin protectant lotion (Reynertson et al., 2015).

CURCUMA LONGA L. (COMMON NAME: TURMERIC; FAMILY: ZINGIBERACEAE)

C. longa is known in Saudi Arabia as 'Kurkum' (Figure 3). The genus named *Curcuma* is the latinized form of the Arabic Al-Kurkum. It is a small rhizomatous perennial herb (Migahid, 1978). It is native in southwest India, and requires temperatures between 20 and 30°C and a great amount of annual rainfall to thrive (Prasad and Aggarwal, 2011). Turmeric grows wild in the forests of South and Southeast Asia. It has been used in Asia for thousands of years and is a main part of Siddha medicine. It was first used as a dye and then later for its medicinal properties (Chattopadhyay et al., 2004).

It is used as a main ingredient of cooking in Asian countries. Because of its yellow colour it is also employed as a dye. It has been widely investigated and found to have many applications. Important applications are in cancer, diabetes, asthma, anemia and intestinal disorders. In dermatology, it has wonderful wound healing activity. Furthermore, it improves skin complexion. It has antioxidant, anti-inflammatory, antiviral, antibacterial and antiseptic properties (Satoskar et al., 1986; Ramirez-Bosca et al., 1995; Khiljee et al., 2011).

In the Siddha system, turmeric was a medicine for a range of diseases and conditions, including those of the skin, pulmonary, and gastrointestinal systems, aches, pains, wounds, sprains and liver disorders. A fresh juice is commonly used in many skin conditions, including eczema, chicken pox, shingles, allergy, and scabies. It has been used traditionally in India for thousands of years as a remedy for stomach and liver ailments, as well as topically to heal sores, basically for its believed antimicrobial property (Chaturvedi, 2009).

For over four thousand years, it has been widely used in Asian traditional medicine for the treatment of loss of appetite, jaundice, liver problems, gall bladder disorders, and arthritis. Hepatoprotective effect of turmeric has been attributed to its antioxidant (Ramirez-Bosca et al., 1995) and anti-inflammatory (Satoskar et al., 1986) properties. In addition, sodium curcumin, a salt of curcumin, exerts choleric effects by increasing biliary excretion of bile salts, cholesterol and bilirubin, supporting its application for cholelithiasis treatment (Al-Asmari et al., 2014).

The most important turmeric chemical constituents are a group of compounds called curcuminoids, which include curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxycurcumin. Curcumin, which constitutes about 3.14% of powdered turmeric (Tayyem et al., 2006). Furthermore, other important volatile oils include turmerone, atlantone and zingiberene. Some common components are sugars, proteins, and resins (Nagpal and Sood, 2013). The active compound curcumin is supposed to have many biological effects including anti-inflammatory, antioxidant, antitumour, antibacterial and antiviral activities, which show potential in clinical medicine (Aggarwal et al., 2007). It is generally used by people for eczema treatment. It appears that the active ingredient curcumin present in turmeric has anti-inflammatory and bactericidal properties, which may assist to treat skin inflammation linked with eczema. The healing effect of turmeric is attributed to polyphenolic curcuminoids including curcumin I, curcumin II, and curcumin III. A medicinal paste of turmeric (turmeric powder mixed with sweet lime juice and salt) is applied on swellings. This paste provides rapid and long lasting relief. Turmeric powder is scattered on wounds/ulcers for fast healing. It is an antiseptic and stops bleeding and cures the cut or burn (Khiljee et al., 2011). Turmeric does not aggravate the stomach as do many Cox-2 inhibitors (Gruenwald et al., 2007; Aggarwal et al., 2007).

Research conducted on male Swiss albino mice in which skin cancer was induced by topical application of 7,12-Dimethylbenz[a]anthracene (DMBA), demonstrated a considerable reduction in number of tumors per mouse in the group receiving 1% curcumin obtained from rhizomes of *C. longa* (Limtrakul, 1997). Toxicity studies on turmeric in animals demonstrated no adverse effect up to 2.5 g/kg b.w. (Shankar et al., 1980). Large doses in humans may cause gastric irritation. The review of Calapai et al. (2014) focuses on contact dermatitis as an adverse effect of a selection of topically used herbal medicinal products for which the European Medicines Agency has completed an evaluation up to the end of November 2013 and for which a Community herbal monograph has been produced. Part 1: *Achillea millefolium* L.–*Curcuma longa* L. As turmeric and other spices are usually sold by weight, the potential presently exists for powders of toxic, cheaper agents with a similar color to be added, such as lead(II,IV) oxide, giving turmeric an orange-red color instead of its original gold-

yellow (Kaul, 2015).

MATRICARIA CHAMOMILA, MATRICARIA RECUTITA OR CHAMOMILLA RECUTITA (COMMON NAME: CHAMOMILE; FAMILY: ASTERACEAE)

Matricaria chamomilla L., generally known as chamomile, is an annual plant. Chamomile is known in Saudi Arabia as 'Babunaj' (Figure 4). It is a well-known and generally used medicinal herb. *M. chamomilla*, a member of the Asteraceae family, is one of the oldest medicinal plants, widely used worldwide for diverse healing applications. It may be found near populated areas all over Europe and temperate Asia, and it has been broadly introduced in temperate North America and Australia. It frequently grows near roads, around landfills, and in cultivated fields as a weed. It is used in herbal medicine for a sore stomach, irritable bowel syndrome, and as a gentle sleep aid. In addition, it is used as a mild laxative and is anti-inflammatory (Bhaskaran et al., 2011) and bactericidal (Tayel and El-Tras, 2009). Its recommendations, derived from both traditional and modern medicine, include many diseases such as inflammation, ulcers, wounds, gastrointestinal disorders, stomach ache, pharyngitis, rheumatic pain. Extracts and decoctions made from chamomile are frequently recommended for treatment of many skin diseases for example, inflammation, wounds and itching. The review of Rügge et al. (2010) explores the evidence base of the dermatological effects of chamomile. Although many beneficial effects of chamomile have been suggested, no studies have so far been able to prove these claims significantly.

The work of Kolodziejczyk-Czepas et al. (2015) is focused on the biological activity of chamomile polyphenolic–polysaccharide conjugates – their antioxidant properties in the protection of blood plasma components against *in vitro* oxidative stress. Their results indicate that polyphenolic–polysaccharide conjugates isolated from *M. chamomilla* substances possess antioxidant properties. The *M. chamomilla* macromolecular glycoconjugates may be useful in the creation of new natural-based medications or dietary supplements, helpful in the prevention and treatment of oxidative stress-mediated disorders. Chamomile is a daisy like herb. It is well-known for its tea which is used in sleep disorders. It is traditionally claimed to be efficient in the treatment of cardiovascular disorders, common cold, sleep, cancer and gastrointestinal disorders. It is found to be efficient in wound healing and skin inflammatory conditions, consequently used in allergic conditions, atopic dermatitis and eczema. Flowers are used to make tea and liquid extracts, capsules and tablets. It is applied to skin in the form of ointment or cream (Blumenthal et al., 2000). Aertgeerts et al. (1985) performed a clinical study in 161 eczema patients using a cream made from chamomile extract. When compared with steroidal and nonsteroidal creams, it was similarly effective as steroidal cream and more effective than non-steroidal cream. Chamomile helps in skin cell regeneration and works as an antioxidant, fighting free radical damage on the skin. Allergies have been reported and those with daisy allergies may discover themselves allergic to chamomile (Renu, 2010).

It possesses flower heads with white internal linguiform flowers and the external tubular – yellow, typical of the Asteraceae family. It contains the essential oil (its main components are α -bisabolol and its oxides A, B and C, matricin, which is converted to chamazulene by distillation and en-yn-dicycloethers) and flavone derivatives such as apigenin, luteolin, and apigenin-7-glucoside (ESCAP Monographs, 2003). It has antibacterial, anti-fungal, anti-inflammatory and antiseptic properties. It is also believed to be hypoallergenic with the ability to neutralize skin irritants. Most studies have been performed in Germany using a chamomile cream or ointment. Chamomile was found to have an effect that was 60% as active as 0.25% hydrocortisone when applied topically in humans. In another study, the chamomile ointment was effective in



Figure 4. *Matricaria chamomile*.

decreasing dermatitis following a single application of sodium lauryl sulfate (Brown and Dattner, 1998).

The dried flowers of chamomile contain many terpenoids and flavonoids contributing to its medicinal properties. Chamomile preparations are usually used for many human diseases such as hay fever, inflammation, muscle spasms, menstrual disorders, insomnia, ulcers, wounds, gastrointestinal disorders, rheumatic pain, and hemorrhoids. Essential oils of chamomile are used widely in cosmetics and aromatherapy. Many different preparations of chamomile have been developed, the most popular of which is in the form of herbal tea. Srivastava et al. (2010) reviewed the use of chamomile in traditional medicine and evaluated its curative and preventive properties.

Matricaria flower extracts revealed anti-inflammatory activity by inhibition of prostaglandins and leukotrienes synthesis *in vitro*. α -bisabolol and apigenin inhibited cyclooxygenase and 5-lipoxygenase activity, chamazulene inhibited only 5-lipoxygenase (Ammon et al., 1996). A dry extract of *matricaria* flower, used locally, inhibited croton oil-induced oedema *in vivo*, comparably to benzydamine (anti-inflammatory synthetic drug) (ESCOP Monographs, 2003). Intradermal use of liposomal apigenin-7-glucoside inhibited skin inflammations induced in rats. Topical use of either the total chamomile extract or the flavonoid fraction was effective in decreasing inflammation in a mouse model for croton oil-induced dermatitis. Apigenin and luteolin were more active than indometacin and phenylbutazone (non-steroidal anti-inflammatory synthetic drugs). Activity reduced in the following order: apigenin, luteolin, quercetin, myricetin, apigenin-7-glucoside, rutin (WHO, 1999).

In humans, an ointment containing *matricaria* flower extract was more efficient than 0.1% hydrocortisone (anti-inflammatory synthetic drug) in reduced chemically-induced toxic dermatitis. Creams containing *matricaria* flower extract decreased UV-induced erythema (ESCOP Monographs, 2003). Anti-inflammatory activity of ointment containing *matricaria* flower extract (treatment of patients suffering from inflammatory dermatoses on hands, forearms and lower legs) was similar to that of 0.25% hydrocortisone, and superior to 0.75% fluocortin butyl ester and 5% buprenorphine (non-steroidal anti-inflammatory synthetic drugs) (Blumenthal et al., 2000). In another study, after 2 weeks of treatment of patients with medium-degree atopic eczema, effectiveness of cream containing *matricaria* flower extract was superior to that of 0.5% hydrocortisone cream regarding the symptoms of pruritus, erythema and desquamation (ESCOP Monographs, 2003).

Studies with animals suggest antispasmodic, anxiolytic, anti-inflammatory and some antimutagenic and cholesterol-lowering effects for chamomile (McKay and Blumberg, 2006). It has sped healing time of wounds in animals (Nayak et al., 2007; Jarrahi, 2008). *In vitro* chamomile has shown moderate antimicrobial and antioxidant properties and significant antiplatelet activity, as well as preliminary results against cancer (McKay and Blumberg, 2006; Srivastava and Gupta, 2007). Chamomile essential oil was demonstrated to be a potential antiviral agent against herpes simplex virus type 2 (HSV-2) *in vitro* (Koch et al., 2008).

The active ingredients of its essential oil are the terpene bisabolol, farnesene, chamazulene, flavonoids (including apigenin, quercetin, patuletin and luteolin) and coumarin (McKay and Blumberg, 2006). The essential oil of chamomile and α -bisabolol

revealed bactericidal and fungicidal activity *in vitro* (chiefly against Gram-positive bacteria, *Staphylococcus aureus*, *Bacillus subtilis* and fungi *Candida albicans*) (WHO, 1999; Schulz et al., 2004). Matricaria flower is externally applied for skin inflammations and irritations, bacterial skin diseases, nappy rash and cradle cap, eczema, wounds, abscesses, frostbite and insect bites (Weiss and Fintelmann, 2000; WHO, 1999; Blumenthal et al., 2000). Matricaria flower is used for baths, compresses or rinses and poultice (ESCAP Monographs, 2003; Blumenthal et al., 2000). Chamomile, a relative of ragweed, may cause allergy symptoms and can cross-react with ragweed pollen in persons with ragweed allergies. Cases of contact allergy have been seldom reported (ESCAP Monographs, 2003).

DISCUSSION

Eczema is considered as a group of medical conditions that cause the skin to become inflamed or irritated. Eczema was estimated as of 2010 to affect about 230 million people worldwide (3.5% of the population) (Hay et al., 2014). In the United States approximately 10% of children have the condition, while in the United Kingdom approximately 20% are affected (McAleer et al., 2012). Al Shobaili (2010) conducted a study of all Saudi patients attending the Qassim University Medical College-affiliated dermatology clinics of the Ministry of Health for a period of 12 months from 1 March, 2008 to 28 February, 2009. The study included 3051 patients comprising 1786 (58.5%) males and 1265 (41.5%) females. Their mean age was 25.3 years. About 71% of the patients were between 5 and 34 years of age. The top five skin diseases were eczema/dermatitis (19.5%), viral infections (16.6%), pilosebaceous disorders (14.4%), pigmentary lesions (11.2%) and hair disorders (7.6%). The main disorder in males was viral skin infections (20.0%), while eczema/dermatitis (20.7%) constituted the most widespread skin disease in females.

The cause of eczema is unknown; however, it is thought to be related to an overactive response by the body's immune system to an irritant. Both endogenous and exogenous factors can cause increase to this inflammatory response (Ronald, 1992). Though there is no cure, most people can efficiently manage their disease with medical treatment and by avoiding irritants and frequent skin moisturizing. The aim of eczema treatment is to relieve and prevent itching, which can lead to infection. Because the disease makes the skin dry and itchy, ointments and creams are recommended to keep the skin moist. Medicines such as over the counter hydrocortisone 1% cream, or prescription topical steroid creams and ointments are frequently prescribed to decrease inflammation along with oral antihistamines to reduce and control the associated itching.

Moreover, if the affected area becomes infected, topical or oral antibiotics may be prescribed to kill the infection-causing microbes. Furthermore, creams based on calcineurin inhibitors might be used (Carr, 2013). Other treatments include tar treatments (chemicals designed to

lessen itching), phototherapy (ultraviolet light therapy applied to the skin), and the drug cyclosporine or oral steroids for persons whose condition does not respond to other treatments. Corticosteroids are a significant treatment, however, side effects caused by long-term and excessive use heavily concern patients. These side effects could be decreased by integrating certain topical herbals to the treatment regimen. Chen et al. (2015) indicated that lower use rate of corticosteroids can be found after traditional Chinese medicine treatment, which can be considered as an integrative therapy for this disease.

In this review, we gathered publications on four common medicinal plants aloe (*A. vera*), oat (*A. sativa*), turmeric (*C. longa*) and chamomile (*M. chamomile*) used to treat eczema and addressed the question whether the treatment of eczema with these medicinal plants is efficient in humans. Though *in vivo* and *in vitro* investigations play a significant role in the evaluation of safety and efficacy of medicinal plants in preclinical trials, there is no perfect denouncement for their final success as human drugs. In addition, there are some conflicting clinical trials reported. Thus, the efficiency of these plants requires to be further clarified.

Many traditional medicines used in folk medicine are reported to have antieczema activity, however, only some have been investigated systematically *in vitro* or/and *in vivo*. Table 1 shows the four medicinal plants utilized in this review and their traditional uses for treating skin diseases. Though several *in vitro* studies have demonstrated the antieczema activity of plant extracts and phytochemicals, there is insufficient evidence in humans. The clinical trials and their highlighted results are limited. In addition, many of these phytochemicals have not been tested for their cytotoxicity, acute toxicity, or/and long-term toxicity in normal cells and animals, which seriously limits *in vivo* investigations. The clinical effectiveness and safety should be examined simultaneously for medicinal plant extracts and compounds. Though good progress has been lately accomplished, the impact of medicinal plants on eczema requires to be explored in more detail.

CONCLUSION

Medicinal plants have a great potential to cure different diseases. Many people worldwide use various plant based products for treating skin problems. These herbs are a rich source of active ingredients and can be safer and more cost effective for the treatment for different skin diseases. Inflammation is a complicated process, necessary for the host defense system. Extreme production of some inflammatory mediators may cause chronic diseases. Plant raw substances can possess an anti-inflammatory action affecting different stages of the inflammation process. They inhibit formation of cytokines

Table 1. List of four medicinal plants utilized in this review and their traditional uses for treating skin diseases.

Herb scientific name	Common name, local name	Family	Habit	Parts used	Selected traditional uses
<i>Aloe vera</i> L.	Aloe, Sabar	Xanthorrhoeaceae	Perennial herb	Leaf gel	Skin diseases including eczema, irritation, burns, wounds, bruises, abrasions, psoriasis, cuts, scrapes, cold sores, sun buns, inflammation, hair loss, rejuvenating, complexion improvement, cosmetic uses, microbial skin diseases
<i>Avena sativa</i> L.	Oat, Shofan	Poaceae	Annual herb	Colloidal oat extract, decoction	Skin diseases including eczema, wounds, irritation, inflammation, erythema, burns, itching, sunburn
<i>Curcuma longa</i> L.	Turmeric, Kurkum	Zingiberaceae	Perennial herb	Rhizome paste, powder	Skin diseases including eczema, wounds, burns, cuts, chicken pox, shingles, allergy, scabies, sores, inflammation, microbial skin diseases, complexion improvement
<i>Matricaria chamomilla</i> L.	Chamomile, Babunaj	Asteraceae	Annual herb	Flower extracts, decoctions, oil	Skin diseases including eczema, wounds, itching, irritation, inflammation, allergic conditions, dermatitis, erythema, bacterial skin diseases, nappy rash, frostbite, cosmetics uses

and eicosanoids, stop the inflammatory reaction cascade from starting, and reduce skin burn, itching or extreme exfoliation. The use of most herbs in treatment of inflammatory skin diseases is based on clinical and pharmacological trials *in vitro* and experiments *in vivo*. However, the use of some of them is based only on their longstanding traditional application in folk medicine. Though these herbs are generally safe to use on the skin, some people can be allergic or sensitive to certain plants, which can cause irritant contact dermatitis or allergic reactions. We constantly need to test new ingredients out before integrating them into any type of skin care regime.

Therefore, there is a need for more *in vitro* and *in vivo* research to evaluate and confirm the efficiency and safety of various herbs in the current era of evidence-based medicine. This is likely to open new horizons in therapeutic medicine. The present review could constitute a good basis for further investigation in the potential discovery of new natural bioactive compounds. Therefore, eczema treatment is complicated. Moreover, screening is essential to reduce any potentially harmful side effects on human skin

and health.

Conflict of Interest

The authors have not declared any conflict of interest.

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