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Review

Medicinal plants used for dermatological disorders among the people of the kingdom of Saudi Arabia: A narrative review

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ABSTRACT

Historically, skin disorders have received less attention in health management than other life-threatening diseases that occur on a global scale. However, numerous skin problems are reported to primary health care systems worldwide, particularly in tropical locations. While modern physicians often address most skin conditions, it is estimated that over 70% of individuals with skin illnesses do not seek treatment. Traditional medicine dates all the way back to human civilization's inception. Numerous materials are utilized in traditional medicinal remedies, but the use of plants is particularly critical. Saudi Arabia is one of the world's most botanically varied countries, having an extensive folk medicine heritage. While several reviews on the use of plants to cure skin disorders has been published worldwide, very few have been undertaken in Saudi Arabia, much alone a comprehensive one. Thus, the present review identified the most significant and medicinally relevant herbs used in the treatment of various dermatological conditions in Saudi Arabia. A total of 43 plants were identified and described in this study. This investigation omitted publications that lacked detailed data and had only fragmented information regarding the herb's traditional use in topical applications.

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1. Introduction

For humans, the skin serves as a shield and exterior barrier against various stimuli. Aside from providing protection, skin also assists humans by regulating temperature, protecting against microorganisms, and adjusting to varied climatic circumstances. From basic skin dryness to complex melanoma, the human skin exhibits a variety of skin-related disorders (Swaney et al., 2021). Skin disorders have historically been given the lowest priority in health management compared to other life-threatening diseases that occur across the globe. However, numerous disorders connected to the skin are reported to primary health care systems all around the world, particularly in tropical areas. According to research, dermatological illnesses account for 1.8 % of worldwide disease burden and are rated fourth among all diseases that impact humans. Skin illnesses impact at least one-third of the population

at some point in their lives, and they affect people of all ages, from infants to the elderly, and from all cultures (Urban et al., 2021; Tizek et al., 2019). There is significant variation in the number of different dermatological diseases among various regional and socio-economical situations. Skin cancers like melanoma, for example, are more common in high-income nations like Central Europe, North America, and Australia (Urban et al., 2021). Even though skin problems are common throughout Asia, few research on skin diseases has been quantitatively reported. According to a 2017 global disease burden study, Inflammatory dermatitis is more common than Acne vulgaris in Asian countries. However, in contrast to the Western world, Asian countries have a low rate of skin cancer (Karimkhani et al., 2017). Dermatitis is the most frequent skin problem in Saudi Arabia, followed by acne and fungal infections. Acute dermatitis is more common in children. Saudi Arabia came in third among Asian nations regarding contact dermatitis (Urban et al., 2021; Alshamrani et al., 2019).

Traditional medicine dates all the way back to the dawn of human civilization. It is the use of written or oral knowledge transferred to us by our ancestors together with their experience, beliefs, and knowledge for the cure of human and animal diseases. Several materials play an important role in traditional medical practice, but the utilization of plants is particularly crucial (Hosseinkhani et al., 2021). Around 80% of people in Asia, Europe,

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Africa, and the Middle East have used traditional medicine expertise to manage their healthcare. The high cost of modern medications in contemporary practices and the availability of extremely promising herbal treatments are cited as reasons for the widespread usage of traditional medicine (Dey et al., 2021). To date, knowledge of traditional medicine has been led to the discovery of several novel compounds. Traditional medicine has proven critical in the treatment of skin problems. While contemporary physicians often treat most skin ailments, it is believed that more than 70% of persons with skin diseases do not seek treatment (Basra and Shahrukh, 2009).

Saudi Arabia is a nation in Southwest Asia, the biggest country in Arabia. It is located on the Arabian Peninsula and borders the Persian Gulf and the Red Sea, and it is located north of Yemen (Fig. 1). Saudi Arabia consists of 13 provinces: Mecca, Riyadh, Eastern, Asir, Jizan, Medina, Al-Qassim, Tabuk, Hail, Najran, Al Jawf, Al Baha, and Northern border region. Saudi Arabia is one of the most botanically diverse countries on the planet. Numerous plants are cultivated in Saudi Arabia, both on the mainland and in the desert, some of which are rather distinctive in their medical characteristics. Saudi Arabia has so far discovered 142 families containing 2200 species. For generations, the people of Saudi Arabia have relied heavily on traditional medicine to treat diseases (Nadi,

2017). The Arabian Peninsula is the birthplace of herbal drugs, and the medical healer, locally known as Hakim, is well versed in their usage (Rahman et al., 2004). Until 1940, only traditional medicine was used to treat ailments; afterward, allopathic medicine took over the role. According to studies, most Saudis are interested in adopting herbal therapy either alone or in conjunction with conventional treatment. It's also interesting to notice that 64% of the country's diabetic population manages their health only with natural medications (Abdel-Kader et al., 2018). While several studies have been published on the use of plants to treat skin problems, relatively few have been conducted in Saudi Arabia, much alone a comprehensive one. Thus, the present review has revealed the medicinally significant plants utilized in various dermatological problems in various locations of Saudi Arabia.

2. Methodology

To locate relevant material, we selected keywords such as herbs, plants, medicinal plants, skin, dermatological, topical, Saudi Arabia, Arabian Peninsula, and traditional medicine. These terms were searched in relevant databases, including Google Scholar, PubMed, and Scopus. We gathered data from research articles, review articles, book chapters, and conference abstracts published



Fig. 1. Map of Saudi Arabia showing the geographical location. (Istockphoto, xxx).

between 1956 and 2021. This review found and described a total of 43 plants (Table 1). Literature that lacked specific data and had only incomplete information about its traditional skin application usage has been excluded. The taxonomic classification of the plant species was determined using the websites <https://www.worldfloraonline.org> and <https://www.ipni.org>.

3. Plants used for dermatological diseases

3.1. *Achillea biebersteinii* Afan

The genus *Achillea* L has 100 species, including *Achillea biebersteinii*. This plant is a perennial villous herb that grows to a maximum height of 60 cm and belongs to the Asteraceae family. They have huge dense compound corymbs on erect stems with radiate heads. It is native to the Arabian Peninsula, including Yemen, Oman, Saudi Arabia, and the Mediterranean. Locally it is known as "Aldefera" in Saudi Arabia. In Saudi Arabia, there are four *Achillea* species (Mirahmadi et al., 2012; Al-Said et al., 2016). In folk medical practice, the aerial part of the plant is used for topical application in cutaneous leishmaniasis and as an insect repellent (Akbar and Al-Yahya, 2011). Its anti-fungal, herbicidal, wound-healing and anti-ulcer properties have been scientifically verified (Kordali et al., 2009; Akkol et al., 2011). The plant contains many essential oils, the most prevalent of which is p-cymene (Al-Said et al., 2016). It has been concluded that essential oils are responsible for anti-leishmanial activity (Al-Sokari et al., 2015).

3.2. *Aerva javanica* (Burm. f.) Juss. Ex Schult

Aerva javanica is a perennial herb of the Amaranthaceae family. They are a wooly erect perennial dioecious plant that grows in woody branches and has a woody base. They may reach a height of 80 cm and have broad leaves. It is commonly cultivated throughout Africa's geographical area and certain Asian countries (Suleiman, 2019). It is widely spread in Saudi Arabia's Asir region, where it is utilized in traditional medicine and locally called as "Al R'a". This plant's leaves and roots are powdered and used as a hemostatic and wound-healing agent (Ali et al., 2017). Phytochemical analysis has revealed the abundant source of essential oils, 3-hydroxy-4-methoxy benzaldehyde, ursolic acid and (E)-N-(4-hydroxy-3-methoxyphenethyl)-3-(4-hydroxy-3-ethoxyphenyl). They have been scientifically proven as anti-viral, anti-plasmodial and anti-oxidant (Movaliya and Zaveri, 2014).

3.3. *Adenium obesum* (Forssk.) Roem. & Schult

The succulent shrub *Adenium obesum* (Forssk.) Roem. & Schult., also known as desert rose, is a member of the Apocynaceae family. It's a bloated pachycaul shrub with fleshy branches and a deciduous trunk. It is an African native found across the Arabian Peninsula (Mirahmadi et al., 2012). The plant is abundantly found in Saudi Arabia's western rocky slopes, known as "Adnah and Algaraz." Latex produced from the areal section of the plant is used with cold water in treating different skin problems by indigenous populations in the Asir region and local traditional customs (Ali et al., 2017). It is anti-viral, anti-bacterial, and anti-oxidant. Glycosides, flavonoids, saponins, tannins, alkaloids, pregnanes, anthocyanins, triterpenoids were found, and anti-oxidant chemicals Rutin, isoquercitrin, and kaempferol 3-O-rutinoside, according to phytochemical analyses (Suleiman and Brima, 2021).

3.4. *Acacia tortilis* (Forssk.) Hayne

Acacia tortilis is a significant species of the *Acacia* genus, which belongs to the Leguminaceae family. The canopy of this tree is umbrella-shaped and flat, with a black trunk and brown branches. It may reach a height of 20 m in most cases. It has a fragrant white blossom and may be found in abundance in desert places, particularly on the African and Arabian continents. It is known as "Alsomer" in Saudi Arabia, and honey made from this flower has long been used to cure ulcers and severe gangrene wounds (Ali et al., 2017). This plant's seeds are high in proteins and soluble carbohydrates and are eaten. This plant has been used to cure infections and gastrointestinal disorders in various regions of the globe. Proximate and minerals, amino acids, fatty acids from seed oils, gum (polysaccharide from the gum), terpenes, hydrolyzable tannins, and flavonoids have all been found in the tree (Muhaisen, 2021).

3.5. *Acalypha fruticosa* (Forssk.) var. *Fruticose*

Acalypha fruticosa is an erect shrub in the Euphorbiaceae family that may reach a height of 1 m. They have a strong aromatic odor and are employed in various therapeutic applications. It is known as "Thefran or Anama" in Saudi Arabia. In Saudi Arabian traditional medicine, the leaf paste is used topically for wounds and skin diseases (Tounekti et al., 2019). They were also used to treat stomach aches and as a venom antidote. The presence of secondary metabolites such as tannins, saponins, flavonoids, alkaloids, and compounds such as 2-methyl-5,7-dihydroxychromone 5-O-d-glucopyranoside, acalyphin, and apigenin has been discovered by phytochemical examination of this plant. This plant's crude extract has been shown to have anti-oxidant, cytotoxic, and wound-healing properties (Fawzy et al., 2017).

3.6. *Achyranthes aspera* Linn

Achyranthes aspera Linn. is a perennial erect plant that belongs to the family Amaranthaceae. It grows to a maximum height of 1–2 m and is often found as a weed around the globe. It is widespread across Saudi Arabia, but is most prevalent in the Al-baha area. In traditional Saudi Arabian medicine, roots extracts are used to treat boils and skin eruptions, where they are referred to as "Mahwat" (Hassan-Abdallah et al., 2013). They have been shown to possess various biological actions, including anti-infertility, abortifacient, anti-parasitic, hypoglycemic, and anti-inflammatory properties. The presence of oleanolic acid, saponins C, ecdysterone, and triacontanol were determined using phytochemical analysis (Srivastav et al., 2011).

3.7. *Aerva lanata* (L.) Juss. Ex Schult

Aerva lanata (L.) Juss. ex Schult is an upright, long-rooted plant with many branches and a woolly-tomentose appearance. They are members of the Amaranthaceae in the genus *Aerva* and reach a maximum height of 1.8 m. Tropical Africa, South Africa, and Saudi Arabia are its natural habitats. It is often found in warm climates. This plant is referred to as "Al-Athlab" in western Saudi Arabia, and the root of the plant is ground into a paste and used topically on scorpion sting areas (Ali-Shtayeh et al., 1998). It is rich in secondary metabolites from plants, including alkaloids (canthin-6 and ervolanine) and flavonoids (kaempferol, quercetin, isorhamnetin, isorhamnetin). Numerous research has shown its anti-bacterial, diuretic, anti-asthmatic, anti-diabetic, and anti-tumor properties (Goyal et al., 2011).

Table 1
Ethnobotanical plant species used as for dermatological diseases in Saudi Arabia.

Sl No	Botanical Name	Vernacular Name	Family	Part used	Mode of Application With literature citation	Reference
1	<i>Achillea biebersteinii</i> Afan.	Aldefera	Asteraceae	Areal parts	Leaves paste is applied in Cutaneous leishmaniasis and as an insect repellent.	(Akbar and Al-Yahya, 2011; Ali et al., 2017)
2	<i>Aerva javanica</i> (Burm.f.) Juss. ex Schult.	Al R'a	Amaranthaceae	Leaves, roots	Leaves and root powder is used as hemostatic and for healing wounds.	(Ali et al., 2017)
3	<i>Adenium obesum</i> (Forssk.) Roem. & Schult.	Adnah, Algaraz	Apocynaceae	Latex	Milky latex of the plant mixed with cool water for various skin diseases.	(Ali et al., 2017)
4	<i>Acacia tortilis</i> (Forssk.) Hayne	Alsomer	Fabaceae	Its honey	The honey from the plant is applied topically for healing ulcers and deep wounds (gangrene).	(Ali et al., 2017)
5	<i>Acalypha fruticosa</i> (Forssk.) var. fruticose	Thefran, Anama	Euphorbiaceae	Leaves	Leaf paste is applied topically for wounds and skin infections.	(Tounekti et al., 2019)
6	<i>Achyranthes aspera</i> Linn.	Mahwat	Amaranthaceae	Root	Root extract is applied to cure boils and skin eruptions.	(Hassan-Abdallah et al., 2013; Watt and Breyer-Brandwijk, 1962)
7	<i>Aerva lanata</i> (L.) Juss. ex Schult	Al-Athlab	Amaranthaceae	Root	Root paste is applied to the scorpion sting area.	(Ali-Shtayah et al., 1998)
8	<i>Aloe vera</i> (L.) Burm. f.	Al-Maguar, Sabar	Asphodelaceae	Leaves	Leaf gel is applied topically for skin problems.	(Dhabe and Abo-Ghazal, 2017)
9	<i>Amaranthus viridis</i> Linn.	Shae, Santeen	Amaranthaceae	Leaves	Leaves paste is applied locally for rheumatism Leaves paste is applied as emollient.	(Rahman et al., 2004)
10	<i>Argemone mexicana</i> Linn.	Tashmerzg	Papaveraceae	Seeds	Crushed seeds are applied around the eye skin for a soothing effect. The exudates are used for skin rashes.	(Brahmachari et al., 2013; Ghazanfar, 1994)
11	<i>Asparagus africanus</i> Lam.	Smin, khurus theeb	Liliaceae	Leaves	Leaf paste is applied topically for leishmaniasis treatment.	(Oketch-Rabah et al., 1997)
12	<i>Asphodelus tenuifolius</i> Cav.	Broque	Liliaceae	Seed and root	Seed and roots poultice is applied for skin problems, eczema, and rheumatism.	(Abdel-Mogib and Basaif, 2002)
13	<i>Blepharis ciliaris</i> L.	Shawk-ul-Dab	Acanthaceae	Leaves and whole herb	Leaf and whole herb paste is applied to cure skin wounds	(El-Ghazali et al., 2010)
14	<i>Commiphora gileadensis</i> (L.) C. Chr.	Al bisham	Burseraceae	Oleogum resin	Topical application in Cutaneous leishmaniasis.	(Ali et al., 2017)
15	<i>Calotropis procera</i> (Aiton) Dryand.	Oshar	Apocynaceae	Latex	Latex is applied for Psoriasis, Leishmaniasis, and skin infections.	(El-Ghazali et al., 2010)
16	<i>Capparis decidua</i> (Forssk.) Edgew.	Tandhab, Sodad	Capparaceae	Leaves	Young leaves are applied as plaster on boils and swellings.	(Rahman et al., 2004)
17	<i>Celosia trigyna</i> L.	Trgana	Amaranthaceae	Leaves	Leaf paste applied locally to boils and skin diseases.	(Watt and Breyer-Brandwijk, 1962)
18	<i>Cissus quadrangularis</i> L.	Salae	Vitaceae	Leaves	Leaves are extracted with olive oil and applied topically for wounds, snake bites, circumcision.	(Abdel-Kader et al., 2018)
19	<i>Cleome viscosa</i> L.	Om-Hanif	Capparidaceae	Leaves	Leaf paste is applied to cure boils.	(Tariq et al., 1987)
20	<i>Dodonaea viscosa</i> (L.) Jacq.	Shath	Sapindaceae	Leaves	Leaf paste is applied to skin burns.	(Ali et al., 2017)
21	<i>Datura metel</i> L.	Binj	Solanaceae	Leaves, roots and seeds	The leaves, roots and seeds extract are used for skin diseases.	(Watt and Breyer-Brandwijk, 1962)
22	<i>Euphorbia schimperi</i> C.Presl	Al dehin	Euphorbiaceae	Milky latex	Milky latex of the plant is used for healing cavernous stinking wounds.	(Ali et al., 2017)
23	<i>Euphorbia dracunculoides</i> Lam.	Yaktin	Euphorbiaceae	Fruits	Fruits pulp is used to remove warts from the skin.	(Tariq et al., 1987)
24	<i>Euphorbia schimperiana</i> Scheele	Lubban	Euphorbiaceae	Latex	Latex is commonly used by farmers to remove plant spines that accidentally get into the skin, the latex having the power to loosen the skin. An extract of leaves and roots is used topically in wounds.	(Nadi, 2017; Abulafatih, 1987; Rahman et al., 2002)
25	<i>Ficus palmata</i> Forssk.	Al hamat	Moraceae	Milky latex of tender branch	Latex is used for removing warts.	(Ali et al., 2017)
26	<i>Fagonia bruguieri</i> DC.	Shika'a	Zygophyllaceae	Leaves	Leaves are soaked in boiled water and applied topically for blisters dermatitis.	(El-Ghazali et al., 2010)
27	<i>Heliotropium bacciferum</i> Forssk.	Ramram	Boraginaceae	Leaves	Leaf paste is applied topically for snake bites and scorpion stings.	(Tounekti et al., 2019)
28	<i>Jatropha curcas</i> L.	Kharat	Euphorbiaceae	Leaves	The leaf juice is used in wounds, eczema and scabies.	(Mossa et al., 1987)
29	<i>Lawsonia inermis</i> L.	Henna	Lythraceae	Leaves	Ground leaves are used to dye and improve hair conditions and soften the skin of hands and feet.	(El-Tawil, 1983)

Table 1 (continued)

Sl No	Botanical Name	Vernacular Name	Family	Part used	Mode of Application With literature citation	Reference
30	<i>Leptadenia pyrotechnica</i> (Forsk.) Decne.	Markh	Asclepiadaceae	Steam	Crushed stems are applied to wounds, psoriasis, eczema and dermatitis.	(Phondani et al., 2016)
31	<i>Moringa peregrina</i> (Forsk.) Fiori	Al ban	Moringaceae	Gums, seeds and its oil, small tender branches	Oil of seed is applied topically for treating burns.	(Ali et al., 2017)
32	<i>Marrubium vulgare</i> L.	Zagome	Lamioideae	Leaves	Leaf powder is used topically to treat wounds.	(Hussein and Dhabe, 2018)
33	<i>Nerium oleander</i> L.	Deflah	Pocynaceae	The roots and leaves	The roots and leaves are used in skin diseases.	(Rahman et al., 2004)
34	<i>Ocimum basilicum</i> L.	Rahan, Rayhan	Lamiaceae	Leaves	Leaf juice is used for ringworms infection. Paste of leaves are placed topically on bruises to avoid infection; leaf paste is applied topically on snake bites	(Tounekti et al., 2019; Mossa et al., 1987)
35	<i>Opuntia ficus-indica</i> (L.) Mill.	Barshoom	Cactaceae	Whole plant	Succulent parts of the plant are applied externally to treat pimples and skin problems	(Abulafatih, 1987)
36	<i>Pergularia tomentosa</i> L.	Ghalqa or Am Lebina	Apocynaceae	Leaves	Leaves paste is used as a remedy for the treatment of skin sores. Leaves of this plant that contain plant latex (milky secretion) have been used in the treatment of skin infections, such as Tinea capitis	(Ads et al., 2021)
38	<i>Rhazya stricta</i> Decne.	Harmal	Whole Saudi	Leaves	Leaves are mixed with oil and used in skin rashes	(El-Ghazali et al., 2010)
37	<i>Ruta chalepensis</i> L.	Alsithab	Rutaceae	Leaves	Leaves are used as dressing for snake bites	(Ali et al., 2017)
39	<i>Senna alexandrina</i> Mill.	Sana, Eshriq	Fabaceae	Leaves	Leaf paste is applied topically in Injuries and skin diseases.	(Tounekti et al., 2019)
40	<i>Sonchus oleraceus</i> (L.) L.	Uddaid	Asteraceae	Leaves	Leaf paste is applied topically for skin infections and sores	(El-Ghazali et al., 2010)
41	<i>Tamarix aphylla</i> (L.) Karst.	Athel	Tamaricaceae	Leaves and roots	Leaves and root paste is used in wound infection.	(El-Ghazali et al., 2010)
42	<i>Withania somnifera</i> (L.) Dun.	Alobeb	Solanaceae	Leaves	Leaves paste is applied for Chronic dermatitis and psoriasis	(Ali et al., 2017)
43	<i>Ziziphus spina christi</i> (L.) Willd.	Al sider	Rhamnaceae	leaves	Leaves soaked in water is used for a topical wash for strengthening hairs (women)	(Ali et al., 2017)

3.8. *Aloe vera* (L.) Burm. F

Aloe vera is a succulent plant species belonging to the genus *Aloe*. It is a member of the Asphodelaceae family. It originated on the Arabian Peninsula, is extensively disseminated and regarded as an invasive species around the globe, and grows more aggressive under stressed circumstances and desert-like terrain. It is a stemless or very short-stemmed plant that grows to a height of 100 cm. It is widespread across Saudi Arabia, most notably in the deserts of the Asir area (Ameen et al., 2021). Locally, it is referred to as "Al-Maguar and Sabar." The leaves gel is used topically to treat a variety of skin conditions. It is also used topically to treat rheumatism (Dhabe and Abo-Ghazal, 2017). It is a physiologically active plant that has been shown to be an important medicinal herb, particularly as an emollient, anti-cancer, anti-oxidant, wound healer, and in various cosmetic applications. *Aloe vera* has the highest concentration of vitamins, minerals, sugars, salicylic acid, sterols, and anthraquinones such as barbaloin, aloe-emodin-9-anthrone, isobarbaloin, anthrone-C-glycosides, and chromones (Ameen et al., 2021).

3.9. *Amaranthus viridis* Linn

Amaranthus viridis Linn. is a perennial plant that grows to a height of 100 cm. This plant is a member of the Amaranthaceae family. It is native to the tropics and subtropics of the earth but is often observed around the world. This plant is mostly found in Saudi Arabia's Al-Khobar, Dammam, Hail, Jeddah, Jizan, Qassim, and Taif provinces (Hasnain et al., 2007). It is referred to locally

as "Shae" and "Santeen". The leaves extract is used topically as an emollient (Rahman et al., 2004). Scientific evidence indicates that the leaves are anti-inflammatory, anti-hepatotoxic, anti-ulcer, anti-allergic, and anti-viral. It is used to address a variety of contemporary issues in a variety of traditional medicinal systems. Due to the plant's high amino acid content, it is often used as a culinary component. They contain a large number of physiologically active secondary metabolites, including saponins, tannins, flavonoids, alkaloids, and steroids (Reyad-ul-Ferdous et al., 2015).

3.10. *Argemone mexicana* Linn

Argemone mexicana Linn. is an annual plant native to Mexico that is now found in a variety of tropical and subtropical regions across the globe. It is a member of the family Papaveraceae and grows to 18 in. tall with thorny stems, leaves, and capsules. This plant is found in arid parts of Saudi Arabia and has spread over huge tracts of damaged rangelands in the Asir region. Locally, it is referred to as "Tashmerzg". In traditional Saudi practice, the seeds were crushed and put to the area around the eyes to provide a topical soothing effect. Additionally, this plant's latex is used to treat moderate skin rashes (Brahmachari et al., 2013; Ghazanfar, 1994). It is a significant economic and medical plant. The seed oil has documented anti-bacterial, anti-viral, anti-fungal, and anti-oxidant properties. The majority of phytochemicals identified from this plant belong to the alkaloids, terpenoids, flavonoids, phenolics, and long-chain aliphatic compounds classes (Brahmachari et al., 2013; Moussa et al., 2012).

3.11. *Asparagus africanus* Lam

Asparagus africanus Lam is a plant with a woody stem, numerous braches, aromatic blooms, and red berries that belong to the Liliaceae family. They are endemic to southern Africa and may reach a height of one meter. It's also found in other parts of the world, including tropical Africa, the Arabian Peninsula, and India. It can grow in both rainforest and semi-desert habitats. The plant can be found in the Abha area of Saudi Arabia. It's called as "Smin" or "khurus theeB" in the area. For the treatment of leishmaniosis, a paste made from fresh leaves is used topically in traditional medicine (Oketch-Rabah et al., 1997). Anti-inflammatory, anti-diabetic, anti-parasitic, anti-bacterial, antifertility, and anti-acetylcholine properties have all been observed in the plant (Dikasso et al., 2006; Zhang et al., 2019). The existence of steroidal saponins such as stigmaterol and sarsasapogenin has been discovered by phytochemical analysis. Muzanzagenin, a saponin isolated from this plant, was shown to have anti-leishmaniosis action *in vitro* (Oketch-Rabah et al., 1997).

3.12. *Asphodelus tenuifolius* Cav

Asphodelus tenuifolius Cav. is a monocotyledonous, erect annual plant with yellowish to brown roots. It is a Mediterranean species found in the Arabian Peninsula, Sudan, and Afghanistan. It is a member of the Liliaceae family and prefers to thrive in places with little or no rainfall (Tripathi, 1968). This plant may be found in Saudi Arabia's Makah, Median, and Abha regions. It's called "Broque" in the area, and a poultice made from it is used to treat skin disorders, dermatitis, and rheumatism in traditional medicine (Abdel-Mogib and Basaif, 2002). This plant has hypotensive, anti-diarrheal, and diuretic properties. The presence of naphthalene and anthraquinone derivatives was discovered by phytochemical isolation. Asphorins A, which inhibits lipoxygenase, and glucopyranosylbianthrone, which have anti-cancer properties, has also been isolated from this plant (Safder et al., 2012; Khalfaoui et al., 2018).

3.13. *Blepharis ciliaris* (L.) B. L

Blepharis ciliaris (L.) B. L. is a perennial branching plant with a grey color that grows to a maximum length of one foot. Although this plant is mostly found in India, it is also found in Saudi Arabia, Egypt, East Africa, and Pakistan. It is a member of the Acanthaceae family and is used to feed ruminants such as sheep and camels. It is locally called "Shawk-ul-Dab" in Saudi Arabia, where its leaves and entire herb paste are customarily used to treat topical wounds (El-Ghazali et al., 2010). It has a variety of biological properties, including astringent, appetizer, diuretic, anti-asthmatic properties, and expectorant, anti-inflammatory, and anti-diabetic properties. It is also used as an ocular treatment to enhance eyesight. Isolation of phytochemicals showed a variety of compounds, including phenolic acids, sterols, and glycosides such as blepharisides A and quercetin 3-O-rutinoside (Dirar et al., 2021).

3.14. *Commiphora gileadensis* (L.) C.Chr

Commiphora gileadensis (L.) C.Chr. is a deciduous shrub or small tree endemic to Eritrea, Ethiopia, Kenya, Sudan, Egypt, and Saudi Arabia. It is a member of the Burseraceae family and is locally known as "Albisham" in Saudi Arabia. Oleogum resin from this tree has historically been used in folk medicine to treat cutaneous leishmaniasis (Ali et al., 2017). Additionally, the decoction of this plant is utilized as a sedative, diuretic, and laxative. They are anti-oxidant and anti-diabetic. This tree bark essential oil contains the monoterpenes -pinene, sabinene, -pinene, p-cymene, limo-

nene, and -terpinene (Dudai et al., 2017; Almulaiky and AL-Farga, 2020).

3.15. *Calotropis procera* (Aiton) Dryand

Calotropis procera (Aiton) Dryand. is an evergreen perennial shrub that may reach a height of 6 m. It is a member of the Apocynaceae family. They are found mainly in arid and semi-arid areas. Africa, Arabian Peninsula, Western Asia, and the Indian Subcontinent are its natural habitats. The plant produces a milky sap in response to injury. It is widespread in Saudi Arabia's arid desert regions. Locally, it is called "Oshar", and the plant's latex has historically been used to treat a variety of skin conditions, including psoriasis, leishmaniasis, and skin infections (El-Ghazali et al., 2010). Apart from its medical properties, the plant is a poison to humans and animals. Cardiotoxic and hepatotoxic properties are ascribed to this substance. It has been employed as a fungicide and pesticide due to its toxicity. It acts as an anti-pyretic, analgesic, anti-depressant, and neuromuscular blocker. Alkaloids, saponins, glycosides, tannins, and phenolic substances have all been identified in the plant (Kaur et al., 2021).

3.16. *Capparis decidua* (Forsk.) Edgew

Capparis decidua (Forsk.) Edgew is a shrub that grows to 5 m in dense tufts. Typically, it is found in tropical and warm temperate areas of India, Africa, and Saudi Arabia. It is a member of the Caparidaceae family. It is found in Saudi Arabia's isolated communities of Taif, Farasan Island, Madina, and Khor Assos. It is referred to locally as "Tandhab" or "Sodad". In traditional medicine, the young leaves of this plant are prepared into plasters and applied on skin boils and swelling (Rahman et al., 2004). They are analgesic, anti-diabetic, anti-cancer, anti-oxidant, anti-epileptic, and antimicrobial. Secondary metabolites found in this plant include phenolics, flavonoids, alkaloids, and fatty acids. Three significant phytochemicals have been identified from it: capparisine, stachydrine, and isocodonocarpine (Mahla et al., 2013).

3.17. *Celosia trigyna* L

Celosia trigyna L. is an annual herb usually referred to as silver spinach. It is a member of the genus *Celosia*, including edible and decorative plants. This plant is used as a vegetable and may reach a height of 1 m. It is considered a weed plant in several parts of the world. In Saudi Arabia, it is locally referred to as "Trgana", a member of the Amaranthaceae family. The leaves of this plant are used topically to boils and skin disorders in traditional medicine. Additionally, it is used to treat diarrhea and menstrual irregularities (Watt and Breyer-Brandwijk, 1962; El-Desouky et al., 2019). This plant has a variety of biological properties, including anti-cancer, anti-oxidant, and analgesic properties. Numerous secondary metabolites have been identified from this plant, including alkaloids, flavonoids, terpenoids, fatty acids, saponins, amino acids, phenolics, and peptides (El-Desouky et al., 2019; Ofusori et al., 2020).

3.18. *Cissus quadrangularis* L

Cissus quadrangularis is a widespread perennial climber found primarily in tropical climates. It's a climbing herb with quadrangular-sectioned branches that can reach a height of 1.5 m (Mishra et al., 2010). The Vitaceae family includes this plant. It is naturally grown in the Al Baha and Jizan regions of Saudi Arabia (Alshehri, 2020). "Salae" is the native name for this plant, which is used in traditional medicine for wounds, snake bites, and circumcision as leaf extracts mixed with olive oil (Abdel-

Kader et al., 2018). Analgesic, antiosteoporotic, anti-oxidant, anti-ulcer, parasymphathomimetic, androgenic, anti hemorrhoidal, and anti-inflammatory activities are among the biological activities of this plant. Flavonoids, triterpenoids, Vitamin C, and stilbene derivatives were among the phytochemicals discovered in this plant. Ascorbic acid, triterpene, sitosterol, and ketosteroid are among the compounds with pharmacological relevance.

3.19. *Cleome viscosa* L

Cleome viscosa L., sometimes known as wild mustard, is an annual, sticky herb that grows as a weed in tropical climates, especially in the Asian subcontinent. It has a distinctive odor and a yellow flower. It belongs to the Capparidaceae family and can reach a maximum height of 1.6 m (Kasem, 2016). This plant can be found in Saudi Arabia's southwest region. It's known as "Om-Hanif" in the area, and it's traditionally used to cure skin boils with a paste made from fresh leaves (Tariq et al., 1987). It is used to treat malaria, hypertension, rheumatoid arthritis, neurasthenia, and snake bites in several traditional systems. It has anti-inflammatory, hepatoprotective, hypoglycemic, anti-cancer, analgesic, and diuretic properties, according to scientific investigations. Many flavonoids were discovered in this plant, including viscosin A, viscosin B, quercetin 3-O-D-glucopyranoside 7-O-L-rhamnopyranoside, kaempferol 3-O-D-glucopyranoside 7-O-L-rhamnopyranoside, and cleomeside A (Suresh et al., 2020).

3.20. *Dodonaea viscosa* (L.) Jacq

Dodonaea viscosa is a tropical evergreen shrub or small tree that may be found in abundance across the region. It is a member of the Sapindaceae family, including roughly 150 genera and 200 species. It is an Australian native found in Saudi Arabia's Hijaz, Eastern, and Southern regions. It is known as "Shath" in Saudi Arabia, where a paste prepared from the plant's leaves is administered topically to cure burns in traditional medicine (Ali et al., 2017). Various research has revealed that it contains anti-bacterial, anti-fungal, antinociceptive, anti-ulcer wound healing, anti-inflammatory, anti-diabetic, and hepatoprotective activities. Many flavonoids have been found in this plant, including Viscosol, Aliarin, Pinocembrin, Santin, Kaempferol, Acacetin, Narigenin, and Genkwanin (Al-Asmari et al., 2017).

3.21. *Datura metel* L

Datura metel, also known as Indian Thornapple, is an annual plant. This plant is often grown in all hot temperature areas across the world, and it is sometimes seen as a weed or decorative plant. It is a member of the Solanaceae family and may reach a height of 6 feet. As a distinguishing characteristic, it boasts 6–8 sweetly fragrant inch flowers. Locally, it is known as "Binj". It grows across Saudi Arabia. Its seeds, leaves, and roots are ground into a paste and administered topically to treat various skin ailments (Watt and Breyer-Brandwijk, 1962). In other traditional practices, this herb has also been used for skin ailments, epilepsy, hysteria, rheumatic pains, hemorrhoids, painful menstruation, skin ulcers, and wounds. Antibacterial, insecticidal, analgesic, anti-inflammatory, anti-pyretic, anti-spasmodic, anti-cancer, and wound healing properties have been demonstrated. Secondary metabolites such as alkaloids, tannins, cardiac glycosides, flavonoids, carbohydrates, amino acids, and phenolic compounds have been discovered in it (Al-Snafi, 2017).

3.22. *Euphorbia schimperi* C. Presl

Euphorbia schimperi is a species of the genus *Euphorbia* that belongs to the family of the Euphorbiaceae. It is a member of the genus *Euphorbia*. It is indigenous to Saudi Arabia's southern region, where it may reach a height of 1.7 m in height. It is known as "Al-dehin" in the Wadi Gama region of Saudi Arabia, where the milky latex collected from the plant is used in traditional medicine practice to cure cavernous stinking wounds (Ali et al., 2017; Ahmed et al., 2017). The plant is native to the Arabian Peninsula. In lab experiments, it has demonstrated wound healing, anti-oxidant, anti-cancer, and anti-Hepatitis B Virus action. This plant's latex contains triterpene alcohol, steroid, flavonoid, and sesquiterpenes, among other things. The presence of luteolin, -amyrin, scopoletin, and kaempferol in the methanol extract of this plant has been demonstrated. In the course of the phytochemical isolation of this plant, it was discovered that it contained key anti-oxidant substances such as quercetin 3-O-glucuronide and kaempferol 3-O-glucuronide, among other compounds (Ahmed et al., 2019).

3.23. *Euphorbia dracunculoides* Lam

Euphorbia dracunculoides Lam. is a short-lived perennial plant that grows up to a height of 40 cm and is found growing in muddy valleys, riverbanks, and roadside regions in Southwest Asia, Europe, and North Africa. It is a member of the Euphorbiaceae family, one of the most prominent flowering plant groups with over 300 species. It is mainly found in southern Saudi Arabia and Yemen. It is locally known as "Yaktin" in Saudi Arabia, and in traditional medicine, the fruit pulp of this plant is used topically to eradicate warts from the skin (Tariq et al., 1987). Other traditional practices include using this herb to treat epilepsy and as a laxative. Scientific investigations have shown that it has hepatoprotective, analgesic, and anti-cancer effects. It was discovered that there is a high concentration of steroids and terpenoids in addition to a few anti-oxidants such as rutin, catechin, caffeic acid, and myricetin (Majid et al., 2015; Batool et al., 2017).

3.24. *Euphorbia schimperiana* Scheele

Euphorbia schimperiana is a tiny shrub or tree native to the Arabian Peninsula's southern regions, such as Saudi Arabia and Yemen. It appears as a branching perennial plant that may reach a height of 50 cm. It is a member of the Euphorbiaceae family, also found in Africa. This plant is rare in Saudi Arabia; however, it is prevalent in the Aseer area. It is known locally as "lubban", and farmers widely use the latex of this plant to remove plant spines that have mistakenly gotten into their skin owing to latex's ability to loosen the skin in traditional medicine. In addition, leaf and root extracts are used topically for wounds (Nadi, 2017; Abulafatih, 1987; Rahman et al., 2002). Coughs, asthma, throat, respiratory ailments, skin infections, anti-snake venom, and ear problems have all been treated using this plant in different traditional medical techniques. In scientific studies, this plant has been shown to be anti-oxidant and effective against the parasite *Schistosoma mansoni*. This plant yielded anti-oxidant phytochemicals such as 3-cycloartenol, chrysin, Quercetin-7-O-D-glucuronoside, and 3-methyl-quercetin-7-O-D-glucuronoside (Aljubiri et al., 2021; Shaker et al., 2015; Al-Zanbagi et al., 2005).

3.25. *Ficus palmata* Forssk

Ficus palmata Forssk. is a tiny tree that may be found across Africa, Arabia, and Asia. It is a member of the Moraceae family,

which includes over 800 species. The majority of the family's members are tall trees, shrubs, and rare plants with milky juice. In Saudi Arabia, it's common in the Agabat Tanoma district of Abha and the Al Baha region. Locals name it "Alhamat", and the tender branch's milky latex is used topically to cure skin warts (Ali et al., 2017). It is utilized as a general tonic, anti-cancer, anti-epilepsy, anti-dysentery, and anti-inflammatory medication in different traditional medical systems. Pharmacological tests have shown it to be hepatoprotective, nephroprotective, ulcer protective, and anti-coagulant. According to a phytochemical study, this plant contains secondary metabolites such as triterpene, furanocoumarins, and glycosides. Pure chemicals such as rutin, germanicol acetate, psoralene, and bergapten have previously been isolated (Alqasoumi et al., 2014; Ramana et al., 2014).

3.26. *Fagonia bruguieri* DC

Fagonia bruguieri DC. is a little mountain tree belonging to the Zygophyllaceae family that is endemic to Saudi Arabia and is considered to have therapeutic properties. In Saudi Arabia, this tree is often found in the Aseer area, where it is referred to as "Shika'a". It is used topically in traditional medicine to cure blisters and dermatitis by applying boiled and cooled water containing leaves of this plant (El-Ghazali et al., 2010). Additionally, Shika'a honey, obtained from this plant, is used topically to promote wound healing. Furthermore, honey has been widely utilized to treat a variety of different ailments, including ulcers, burns, hepatitis, and respiratory issues. In preclinical development, this plant was shown to have anti-inflammatory, anti-oxidant, and liver-protective properties (Halawani, 2021).

3.27. *Heliotropium bacciferum*

Heliotropium bacciferum is a short sessile perennial rigid shrub. This plant is endemic to North West Africa and North East India, and it belongs to the Boraginaceae family. It is also accessible throughout the Arabian Peninsula, with the Hofuf area of Saudi Arabia's Eastern Province being the most common location. It's known as "ramram" in the area, and leaf paste is used topically for snake bites and scorpion stings in traditional medicine (Tounekti et al., 2019). It is also used in other conventional practices to treat skin diseases such as burns, tinea, and boils. Tonsillitis is treated with it as a gargle. This plant has been studied for pharmacological activities such as anti-oxidant, anti-cancer and anti-bacterial properties. During the phytochemical analysis, alkaloids, Sterol, nor-isoprenoids, tannins, flavonoids, phenols, C-11 terpene lactones, and a monoterpene were discovered (Aïssaoui et al., 2019; Ahmad et al., 2014; Fathalipour-Rayeni et al., 2021).

3.28. *Jatropha curcas* L

Jatropha curcas L. is a blooming semi-evergreen shrub or plant that may grow up to 6 m in height. The Euphorbiaceae family includes this plant, which is endemic to Mexico. It is accessible in Saudi Arabia, particularly in the Jizan province's Jabal Fayfa region. It is locally known as "Kharat", and the leaf juice is used in traditional medicine to treat wounds, eczema, and scabies (Mossa et al., 1987). It is also used to treat ulcers, toothaches, bleeding, inflammation, eczema, and fracture healing in various folk medical traditions. According to studies, this plant has anti-bacterial, anti-fungal, anti-viral, anti-oxidant, anti-coagulant, anti-diarrheal, wound healing, and anthelmintic properties. Curcain, tannins, glycosides, flavonoids, and saponinins were found in the phytochemical examination. It contains a lot of fatty acids (Kumar and Tewari, 2015).

3.29. *Lawsonia inermis* L

Henna, also known as *Lawsonia inermis* L., is a tall blooming shrub or small tree that may reach a height of 8 m. It is a natural source of skin color that is utilized all over the globe. This plant, which is native to Africa, Asia, and Australia and thrives in tropical regions, belongs to the Lythraceae family. It is cultivated in several parts of Saudi Arabia, particularly in the north. Ground leaves were used to colour and enhance hair condition, as well as soften the skin on hands and feet, in traditional customs known as Henna (El-Tawil, 1983). It's utilized in a variety of classic cosmetic procedures. The leaves of this plant include anti-oxidants, cytotoxic, and anti-bacterial properties, among other things. The primary phytochemicals found in this plant include lawsone (2-hydroxynaphthoquinone), mucilage, mannite, gallic acid, and tannic acid (Elansary et al., 2020).

3.30. *Leptadenia pyrotechnica* (Forssk.) Decne

Leptadenia pyrotechnica (Forssk.) Decne is a flower-bearing perennial shrub that may reach a height of three meters. It is a desert plant belonging to the Asclepiadaceae family. It is indigenous to the Mediterranean and African regions. It is locally called "Markh" in Saudi Arabia, which is plentiful in the Jizan area. Crushed stems are used to treat wounds, psoriasis, eczema, and dermatitis in traditional Medicine (Phondani et al., 2016). It's also used to treat constipation, obesity, dysmenorrhea, GIT issues, flu, cough, fever, renal damage, and ringworm infection in various traditional therapies. Anti-bacterial, anti-fungal, anti-cancer, anti-oxidant, anthelmintic, antidiabetic, hepatoprotective, anti-tumor, and wound healing effects have been discovered in this plant. Meanwhile, fatty acids, alkaloids, flavonoids, glycosides, and terpenes were found in the phytochemical investigation (Idrees et al., 2016; El-Demerdash et al., 1994).

3.31. *Moringa peregrina* (Forssk.) Fiori

Moringa oleifera (Forssk.) Fiori is a deciduous tree that grows up to ten meters in height. The formation of root tubers during the seedling phase and the fall of their leaflets as the leaves develop distinguish this plant from other members of the same family. It is a member of the Moringaceae family and is indigenous to the Arabian Peninsula. It is found throughout Africa and India. It is predominantly found in Saudi Arabia's north and Fayfa Mountains in the south, where it is locally referred to as "Alban". In traditional Saudi medicine, the oil of this plant's seed is used topically to cure burns (Ali et al., 2017). It treats skin rashes, diabetes, wound healing, fever, and stomach discomfort in various traditional treatments. Biological investigations have shown its anti-oxidant, anti-bacterial, anti-spasmodic, anti-cancer, hepatoprotective, neuroprotective, anti-spasmodic, and anti-spasmodic properties and its efficacy as a cholesterol-lowering agent. It is a good source of nutrients. They contain a variety of phytochemicals with therapeutic properties, including Rhamnetin-3-Orutinoside, Sitosterol, -Amyrin, Quercetin, Isothiocyanates, and Rhamnetin (Senthilkumar et al., 2018; Robiansyah et al., 2014).

3.32. *Marrubium vulgare* L

Marrubium vulgare L. grows to a height of 1 m as an annual or perennial plant. It is indigenous to the Mediterranean area but is found worldwide. It is a member of the Lamioideae family and is located in a few locations around Saudi Arabia, most notably Al-Taif governorate. It is locally known as "Zagome" in Saudi Arabia, and the leaves of this plant are powdered and used topically to cure wounds (Hussein and Dhabe, 2018). It is used in several folk

medicinal systems as an anti-inflammatory, to treat GI problems, respiratory illnesses, jaundice, and painful menstruation, as a laxative, to treat ulcers, and as a hypotensive, hypoglycemic, and cardioprotective drug. Laboratory investigations indicate that this plant exhibits anti-oxidant, hepatoprotective, anti-proliferative, anti-inflammatory, sedative, immunomodulatory, hypoglycemia, and hypolipidemic properties. It has a high concentration of phenolic and flavonoids. It includes limonene, α -pinene, sabinene, marrubic acid, and vulgarin (Aćimović et al., 2020; Elberry et al., 2010).

3.33. *Nerium oleander* L

The evergreen blooming shrub *Nerium oleander* L. reaches a height of 4 m. It is native to the Mediterranean, although it may be found all over the globe. It is a member of the Poinciaceae family and may be found across Saudi Arabia, particularly in Buraidah in the Al-Qassim Region. It is locally known as "Deflah", and its roots and leaves are utilized to treat a variety of skin illnesses (Rahman et al., 2004). Because this plant has multiple lethal constituents, it must be used with caution. It's also utilized as an anti-cancer, diuretic, molluscicide, epilepsy treatment, snakebite treatment, and cardioprotectant in various traditional therapies. According to scientific investigations, this plant contains anti-cancer, anti-inflammatory, anti-bacterial, analgesic, and CNS depressive properties. Cardenolide, neridiginoside, nerizoside, neritaloside, and odoroside are some of the phytochemicals extracted from this plant that have therapeutic properties. cardenolides including a new cardenolide, neridiginoside and three known constituents, nerizoside, neritaloside and odoroside-H (Al-Yahya et al., 2000; Begum et al., 1999).

3.34. *Ocimum basilicum* L

The plant *Ocimum basilicum* L., popularly known as sweet basil, is native to tropical Asia and Africa. It is a member of the Lamiaceae family and can be found all over the globe. It can be found in Saudi Arabia's northern and makkah provinces, particularly in the Al Madinah Al Munwara areas. It is locally called as "Rahan", or "Rayhan", in Saudi Arabia, where the leaf juice is used to treat ringworm infection. Furthermore, leaf paste is administered topically to bruises to prevent infection, and leaf paste is applied topically to snake bites (Tounekti et al., 2019; Mossa et al., 1987). Plant components and essential oils from these leaves are utilized in a variety of culinary preparations as well as in traditional medicine for headaches, diarrhea, and renal difficulties. The flavor and fragrance of its essential oil are well-known. This plant has Linalool, Geraniol, Estragole, Methyl Cinnamate, and Eugenol are phytochemicals extracted from the oil of this plant that has been shown to have therapeutic use (Dhama et al., ; Farouk et al., 2016).

3.35. *Opuntia ficus-indica* (L.) Mill

Opuntia ficus-indica is a perennial shrub that grows wild across the world's arid and semi-arid regions. It may reach a height of 5 m. It is a member of the Cactaceae family and is endemic to Mexico. It is abundant in Saudi Arabia, particularly in the vegetation-dense regions of the southwestern ranges and the Hijaz Mountains. Locally called as "barshoom", the whole succulent section of this plant is administered topically to cure pimples and other diverse skin problems in traditional medicine (Abulafatih, 1987). This herb has been utilized in several traditional medical systems to treat diabetes, asthma, GI disorders, and ulcers. It is also utilized as a shampoo and skin cream preparation in certain areas. Scientific evidence indicates that this plant is capable of scavenging free radicals, is anti-inflammatory, anti-cancer, anti-bacterial, and has neu-

roprotective properties. This plant's cladode is an excellent source of vitamins and minerals. Additionally, fatty acids, amino acids, carotenoids, and sterols are present (Silva et al., 2021; Zhong et al., 2010).

3.36. *Pergularia tomentosa* L

Pergularia tomentosa L. is a perennial climbing to semi-erect plant that may reach a height of 3 m. It is a member of the Apocynaceae family and may be found in many parts of the world, including Africa, the Middle East, and the Gulf. It is prevalent in the Taif area of Saudi Arabia. "Ghalqa" or "Am Lebina" is the local names for it. It is used to treat skin lesions in traditional medicine. Skin diseases such as *Tinea capitis* are treated with the milky latex found in the leaves of this plant (Ads et al., 2021). In various traditional traditions, it is also employed as an anti-rheumatic, laxative, and anti-bronchitis and TB remedy. Studies have shown this plant to be anti-oxidant, anti-inflammatory, hypoglycemic, anti-cancer, anti-bacterial, and anti-leishmanial. This plant contains secondary metabolites such as saponins, glycosides, alkaloids, tannis, and flavonoids (Abba et al., 2020; Haddaji et al., 2021).

3.37. *Rhazya stricta* Decne

Rhazya stricta Decne. is an evergreen shrub of the Apocynaceae family that is indigenous to Iran, Pakistan, Yemen, and Oman. It reaches a maximum height of 0.4 m and is extensively distributed across Saudi Arabia. It is found in silty and sandy soils across Saudi Arabia, where it is referred to as "Harmal". In Saudi Arabian traditional medicine, the leaves paste is combined with oil and used topically to cure rashes (Ghazanfar, 1994; El-Ghazali et al., 2010). Additionally, preparations of the leaves were used to treat parasite infection, rheumatism, and syphilis. It is also used in various traditional techniques to treat pimples, acne, conjunctivitis, and burns. Anti-bacterial, anti-fungal, anti-oxidant, anti-diabetic, anti-cancer, smooth muscle relaxant, anti-hypertensive, and anti-inflammatory properties have been shown for this plant. Numerous alkaloids, tannins, phenolic acids, flavonoids, and tannins are found in this plant. Additionally, it has a high concentration of several metals (Albeshri et al., 2021).

3.38. *Ruta chalepensis* L

Ruta chalepensis L. is an aromatic perennial plant initially found in Mediterranean areas but is now present in many parts of the world. It belongs to the family Rutaceae, and is mostly grown for its medicinal benefits. This plant is commonly accessible in Saudi Arabia, particularly in the Albaha and Jizan districts. It's known as "alsithab" in the area, and its leaves are used as a topical treatment for snake bites (Ali et al., 2017). It is historically used in Saudi Arabia for different illnesses such as rheumatism therapy, anti-pyretics, and mental problems. This herb is well-known for neuralgia, menstrual difficulties, convulsions, and fever in various traditional medical traditions. Scientific investigations have shown its anti-oxidant, anti-bacterial, anti-inflammatory, and anti-depressant properties. Alkaloids, flavonoids, saponins, amino acids, and phenols are among the secondary metabolites found in them (Alotaibi et al., 2018; Al-Said et al., 1990).

3.39. *Senna alexandrina* Mill

Senna alexandrina Mill. is a perennial herb that grows to a height of 80 cm. It is indigenous to Somalia and Asia but has now spread to other parts of the world. It is a member of the Fabaceae family and is widespread across Saudi Arabia, particularly in Jizan Province. Locally called as "Sana" or "Eshriq", it is used topically in tra-

ditional medicine to treat injuries and skin diseases as a leaf paste (Tounekti et al., 2019). In various traditional practices, this plant is used to treat leukemia, jaundice, intestinal worms, and as an anti-bacterial agent and ease constipation owing to its laxative properties. Antibacterial, antimicrobial, anti-obesity, and anti-diabetic properties have been shown in the leaves of this plant. Senna leaves have a high concentration of anthraquinones, including chrysophanol and fissiona. Additionally, they include glycosides like sennosides, flavonoids, and sterols (Abbas and Rani, 2020; Elansary et al., 2018).

3.40. *Sonchus oleraceus* (L.) L

Sonchus oleraceus L. is an annual flowering plant that grows to a height of 100 cm with hollow stems. It is generally referred to as milk thistle and is a member of the Asteraceae family. It is also a well-known traditional medicine. This plant is widespread across Saudi Arabia, most notably in the Al-Dhelam area near Riyadh. Locally, it is called "Uddaid", and the leaf paste is used topically to treat ulcers and different skin ailments in traditional medicine (El-Ghazali et al., 2010). This plant is used in a variety of traditional methods to treat hepatitis, cancer, inflammation, discomfort, and rheumatism. They have been shown to be anti-oxidant, anti-bacterial, anti-cancer, anxiolytic, hepatoprotective, anti-inflammatory, and antimicrobial. As secondary metabolites, the phytochemical study revealed that it includes alkaloids, saponins, glycosides, and tannins. Several medicinally significant phytochemicals have also been found, including taraxasterol, apigenin 7-glucuronide, and luteolin 7-glucoside (Alothman et al., 2018; Li and Yang, 2018).

3.41. *Tamarix aphylla* (L.) Karst

Tamarix aphylla (L.) Karst. is a medium-sized, multi-stemmed tree. They may reach a height of 12 m and are members of the Tamaricaceae family. It may be found throughout Africa, the Arabian Peninsula, and parts of southwest Asia. It is most prevalent in Saudi Arabia's Asir area, Jizan, and Al Baha provinces. They grow well in low-temperature climates in Saudi Arabia. It's known as "Athel" in the area, and it's historically been used topically to treat wound infections using a paste of leaves and roots (El-Ghazali et al., 2010). It is known for anti-rheumatic, throat infection, analgesic, antidiarrheal, carminative, anti-cancer, and anti-pyretic properties in other traditional treatments. This plant possesses anti-bacterial, analgesic, anti-diabetic, anti-fungal, and anti-inflammatory properties, according to studies. Secondary metabolites include glycosides, terpenoids, alkaloids, saponins, and terpenes. This plant's anti-oxidant ability was linked to gallic acid, ellagic acid, and caffeic acid. Quercetin, apigenin, and leuteolin are also present (Suleiman, 2019; Ali et al., 2019).

3.42. *Withania somnifera* (L.) Dun

Withania somnifera (L.) Dun is a tiny woody plant that is a member of the Solanaceae family. It is indigenous to Africa and is found in large numbers in India, Sri Lanka, Afghanistan, Morocco, and Jordan. In Saudi Arabia, it is found in the Jizan Province's Fyfa Mountains. It is referred to locally as "Alobeb", and the leaves of this plant are used topically as a paste to treat chronic dermatitis and psoriasis (Ali et al., 2017; Tounekti et al., 2019). It is utilized for a variety of purposes in different traditional medical systems, most notably to revitalize and strengthen the body and muscles. Additionally, it has been used to strengthen the adrenal glands and reproductive systems. In investigations, this plant has been shown to have anti-inflammatory, anti-cancer, anti-diabetic, immunomodulatory, and cardioprotective properties. Additionally,

it has been shown to be beneficial in the treatment of epilepsy, ulcers, coughs, asthma, sleeplessness, and conjunctivitis. The phytochemical investigation of this plant indicated the presence of sitoindoside, a phytochemical with therapeutic properties. Additionally, withaferin A and withanolide D, as well as a number of critical amino acids, have been found (Kulkarni and Dhir, 2008).

3.43. *Ziziphus spina christi* (L.) Willd

Ziziphus spina christi (L.) Willd. is a shrub or tree that may reach a height of 20 m. It is found in warm, tropical areas such as Africa, East Asia, and the Middle East. It belongs to the Rhamnaceae family and may be found in the Asir, Jabal Shada north of Mikhwa south of Baha, Wadi Murabbat, and Ad-Darb areas of Saudi Arabia. It's known as "Alsider" in the area, and women have long utilized water prepared from the leaves topically to strengthen their hair (Ali et al., 2017). In several African nations, the fruit of this tree is consumed. It's utilized as a hypoglycemic, hypolipemic, anti-inflammatory, anti-oxidant, anti-malarial, for headaches, snake bites, and hepatoprotectant in different traditional medicinal systems. Anti-inflammatory, anti-bacterial, anti-oxidant, anti-fungal, and anti-diabetic effects have been discovered in the leaves of this plant. The primary and medicinally significant component identified from this plant is christinin-A. Flavonoids, saponins, alkaloids, lipids, proteins, and mucilage are among the secondary metabolites found in this plant (Asgarpanah and Haghghat, 2012; Saied et al., 2008).

4. Conclusion

In summary, this review demonstrates that Saudi Arabia's dermatologically utilized folk medicine practice is quite diversified in terms of medicinal herbs. We conducted a thorough search across many platforms and discovered that 43 plants have considerable evidence supporting their use in dermatology. It is clear from our research that the bulk of plants used in traditional medicine has not been well explored scientifically, particularly their specific benefits in topical application. According to this review, the most often utilized plant portion is leaves (Fig. 2), followed by latex and roots. Fruits were very rarely employed in dermatological applications. The majority of plants used in skin care were members of the Amaranthaceae and Euphorbeaceae families (Fig. 3). This comprehensive study will give valuable information for future research to validate the efficacy of traditional plants and determine the viability of commercialization. We warrant further detailed investigations on individual plants which will enable it to reach the general public in different suitable formulations.

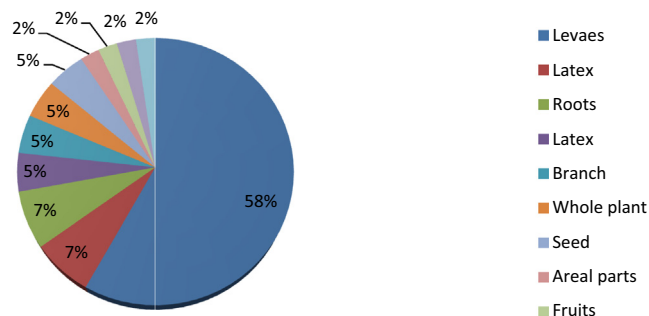


Fig. 2. Percentage of plant parts used for dermatological folk medicine in Saudi Arabia.

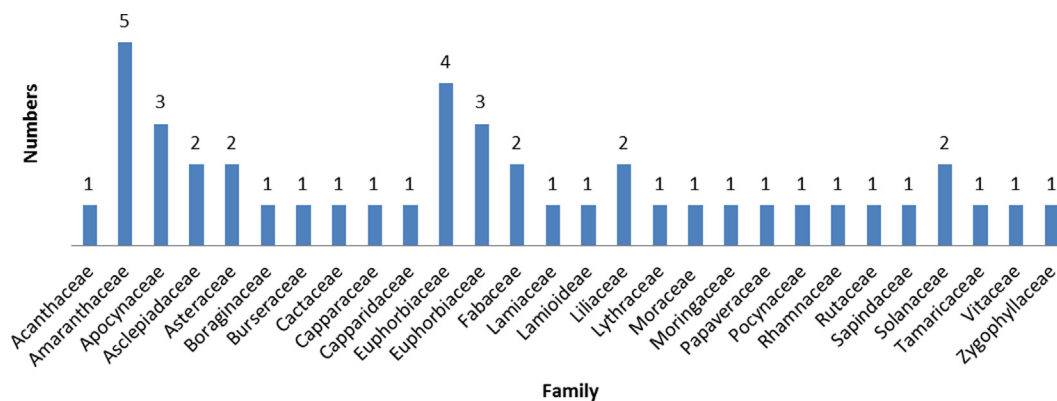


Fig. 3. Family of plants used for dermatological folk medicine in Saudi Arabia.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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