

Ethnobotanical survey of medicinal plants native to the mountains of Jazan, southwestern Saudi Arabia



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ABSTRACT

This exclusive study focuses on the medicinal plants indigenous to the mountains of South Western Saudi Arabia, resulting in the documentation of 83 vascular plant species belonging to 69 genera and 33 families. Among these, 34 plants are noted for their previously unrecorded medicinal properties, including the documentation of new medicinal plants such as *Pyrostria phyllanthoidea* and *Chenopodium fasciculosum*. Fabaceae emerges as the dominant family, with 11 medicinal plant species, followed by Apocynaceae, Asteraceae, Acanthaceae, Euphorbiaceae, and Moraceae. The most abundant genus is *Vachellia*, represented by 4 species, followed by *Euphorbia*, *Ficus*, *Indigofera*, *Aloe*, *Capparis*, *Cissus*, *Commiphora*, and *Ziziphus*. The medicinal plants encompass various growth forms, with shrubs being the most commonly observed, followed by herbs, trees, and climbers. Leaves are the most frequently used plant part for medicinal preparations, followed by stems, roots, latex, bark, and fruits. The preparations primarily involve making a paste, followed by raw use, infusion, and decoction. Diverse routes of administration are noticed, including topical, oral, toothbrush, nasal, and optical applications. Among the species surveyed, *Salvadora persica* stands out as the most useful, with a significant use value of 1.9. The informant consensus factor (FIC) analysis highlights 48 use reports for treating cuts and wounds. Furthermore, 42 species exhibit 100% fidelity, indicating a high preference among informants for their effectiveness in treating specific ailments. To safeguard and preserve this traditional knowledge for future generations, further scientific documentation, along with phytochemical and pharmacological studies, is essential. This study underscores the importance of conserving the rich ethnobotanical heritage of medicinal plants in the region and encourages further exploration of their potential therapeutic benefits.

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1. Introduction

Throughout history, plants have been an inseparable and integral aspect of human life and culture. They have served diverse purposes, but it is the exploration and documentation of medicinal plants that have garnered significant attention across various regions and human societies. These

plants are highly regarded for their potential to provide remedies for a wide array of ailments. This fact has been substantiated by the comprehensive compilation of global plant and fungi data undertaken by the esteemed Royal Botanical Garden, Kew (Antonelli et al., 2020). which states that out of 347,298 estimated vascular plants known to science and over 30,000 plant species have at least one documented use, perhaps unsurprisingly, the largest number of plants with a documented use is those that have been utilized as medicines which is estimated as 25,791 plant species distributed in different continents of the Earth. Healing with medicinal plants is an old treatment method as old as mankind itself (Srivastava, 2018). Awareness of medicinal plant usage is a result of the many years of

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struggles against diseases and man learned to pursue drugs in barks, seeds, fruits, and other parts of the plants. Medicinal plants used for personal health care and environmental esthetics are ecologically sound and they come with the territory (Asdaq et al., 2021). 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 (Almoshari, 2022).

The Arabian peninsula is the birthplace of herbal drugs, and the use of folk medicine (Aati et al., 2019). Traditional medicine occupies a significant part of Saudi Arabia's heritage and it is widely practiced until now (Rahman et al., 2004). The use of herbal drugs in the Kingdom of Saudi Arabia has its roots in ancient times. Many Arab physicians or generations established medicine as a science using the healing properties of different plant species (Al-Harbi, 2017). This knowledge has survived till date and an array of herb shops are found in the markets of the modern Saudi Arabian cities (Bajrai, 2010). 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 (Almoshari, 2022). Traditional medicine in Saudi Arabia is based on herbal remedies and spiritual healing. There is hardly a city or village in the country where traditional medicines are not used or sold. They are also commonly used in home remedies for certain ailments (WHO, 2001).

Despite the use of traditional medicine over many centuries, only a relatively small number of plant species has been studied for possible medical applications and the spread of this knowledge is mostly limited to indigenous societies. Regarding the documentation of the traditional medicinal plants, there is a contribution from Saudi Arabian botanists which spread over the last four decades (Ullah et al., 2020; El-Tawil, 1983; Aati et al., 2019; Rahman et al., 2004; Abulafatih, 1987; Al-Said, 1993; Al-Harbi, 2017; Aboul-Enein, 2014; Bukhari et al., 2015; Mandaville, 2011; Sher and Alyemini, 2011; Mohamed et al., 2015; Sher et al., 2010; Al-Sodany et al., 2013; Ali et al., 2017; Abdel-Kader et al., 2018; Al-Asmari et al., 2017; Helal et al., 2019; Tounekti et al., 2019; Qari et al., 2021; Alqethami and Aldhebiani, 2021). The natural source of medicinal plants and the traditional knowledge associated with various plant resources are disappearing very fast due to the lack of proper conservation measures and scientific documentation. Though a limited number of professionals have attempted to document the medicinal plants and traditional knowledge in some parts of the Kingdom of Saudi Arabia, there is a need to do more in parts where such studies have not been conducted due to the lack of awareness and accessibility due to varied geo-climatic conditions. Regarding the medicinal plants used by various traditional communities mostly they rely on dried

parts of medicinal plants available from markets and the limited knowledge they possess on native plants available around their surroundings. According to Aati et al. (2019), out of 2253 vascular plants only 471 native plants were involved in the preparations of traditional medicines. Native plants are those plants indigenously occurring in wild habitats and have a significant role in the life and culture of traditional ethnic communities living in the respective localities. Therefore a study was conducted with special reference to the documentation of native medicinal plants used in people's lives in mountain southwestern Saudi Arabia.

2. Research method

2.1. Study area

The study was conducted among the people living in the mountains of the Jazan region of southwestern Saudi Arabia such as Al-Aridah (170 05' N 430 04' E), Jabal Fayfa (170 14' N 430 05' E), Al-Hashr (170 27' N 430 02' E) and Haroob (170 28' N 420 50' E) (Fig. 1). The mountains of southwestern Saudi Arabia are domiciles of 42 tribal communities. The tribes are living in the mountains as traditional farmers also rearing livestock.

2.2. Data collection

Reconnaissance surveys were conducted from April 2021 to August 2021 to identify the informants. Detailed field explorations were conducted from September 2021 to October 2022 using standard sociological survey tools such as Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA). The selected informants were interviewed regularly and the information gathered was checked through field walks with them and all the medicinal plants collected for preparing Herbarium voucher specimens. The standard Herbarium methods were followed (Hansen, 1991) to prepare the voucher specimen. The Herbarium specimens were deposited in the Jazan University herbarium (JAZUH) for further reference.

2.3. Analysis of data

The information on various medicinal plants native to the four study sites was arranged in tabular columns with botanical name, family, vernacular name, part used, disease treated, mode of application, mode of preparation, and dosage. The 72 ailments noticed were categorized into 16 ailment categories based on Cook (1995). The informant consensus factor (Trotter and Logan, 1986) was calculated using the following formula:

$$FIC = \frac{Nur - Nt}{(Nur - 1)}$$

where, "Nur" refers to the total number of use reports for each disease cluster, and "Nt" refers to

the total number of species used for that cluster. This formula was used to find out the homogeneity in the

ethnomedicinal information documented by the traditional informants.

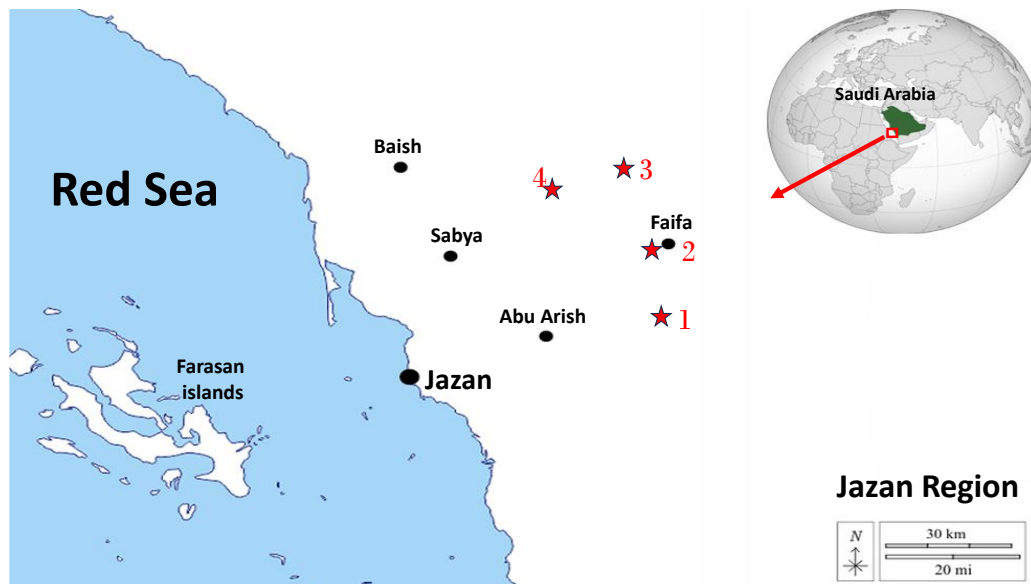


Fig. 1: Study area (1. Al-Aridah, 2. Jabal Fayfa, 3. Al-Hashr, and 4. Haroob)

The Use Value (UV) is the importance of a species in terms of its use in herbal remedies in relation to other species (Phillips et al., 1994), the UV was calculated using the following formula:

$$UV = \sum U/N$$

where, “U” refers to the number of uses mentioned by the informants for a given species, and “N” refers to the total number of informants interviewed. If a plant secures a high UV score that indicates there are many use reports for that plant, while a low score indicates fewer use reports cited by the informants.

Fidelity level (FL) is a tool to determine the most frequently used plant species as per the informants for the treatment of a disease in a particular ailment

category (Friedman et al., 1986). FL index is calculated using this formula:

$$FL(\%) = Ip/Iu \times 100$$

where, “Ip” is the number of informants who independently indicated the use of a species for the same major ailment, and “Iu” is the total number of informants who mentioned the plant for any major ailment.

3. Results

The study on native medicinal plants used among the people of the mountains of the Jazan Region resulted in the documentation of 83 vascular plants belonging to 69 genera and 33 families (Table 1).

Table 1: List of native medicinal plants used by the people who live in the mountains of Jazan Region southwestern Saudi Arabia

Botanical name and family	Vernacular name	Part used	Use value	Disease treated	Route of administration	Mode of preparation
TREES						
<i>Barbeya oleoides</i> Schweinf. BARBEYACEAE	Al Atim	Leaves	0.80	Diabetes	Oral	Infusion
<i>Commiphora myrrha</i> (T.Nees) Engl. BURSERACEAE	Almorr	Resin	1.20	Cold Skin sensitivity Wound	Oral Topical Topical	Infusion Paste Paste
<i>Commiphora gileadensis</i> (L.) C.Chr. BURSERACEAE	Basham	Stem	1.40	Healthy gum and tooth	Toothbrush	Raw
<i>Euclea racemosa</i> subsp. <i>schimperi</i> (A.DC.) F.White EBENACEAE	Qahaz	Roots	0.60	Teeth polishing and whitening	Toothbrush	Raw
<i>Ficus cordata</i> subsp. <i>salicifolia</i> (Vahl) C.C.Berg MORACEAE	Alathab	Leaves	0.80	Muscle sprain	Topical	Maceration
<i>Ficus sycomorus</i> L. MORACEAE	Alebraa	Stem	0.70	Gangrene	Topical	Burned
<i>Olea europaea</i> subsp. <i>cuspidata</i> (Wall. and G.Don) Cif. OLEACEAE	Otum	Leaves Stem	0.80	Mouth ulcers Inflammation in gums Headache Wound	Oral Toothbrush Topical	Raw Paste Paste
<i>Ricinus communis</i> L. EUPHORBIACEAE	Khurwa Aljar	Leaves	1.20	Urinary Tract infection Stomach problem	Oral Oral	Decoction Infusion
<i>Tamarindus indica</i> L. FABACEAE	Homur/Tamurhindi	Fruit	1.40	Stomach problem, cold and fever	Oral	Decoction

<i>Vachellia etbaica</i> (Schweinf.) Kyal. and Boatwr. FABACEAE	Kurd	Leaves	1.20	Stomach ulcers	Oral	Raw
<i>Vachellia flava</i> (Forssk.) Kyal. and Boatwr. FABACEAE	Salam	Bark	0.80	Scabies	Topical	Paste
<i>Vachellia oerfota</i> (Forssk.) Kyal. and Boatwr. FABACEAE	Alearfut	Bark	0.80	Jaundice	Oral	Infusion
<i>Vachellia seyal</i> (Delile) P.J.H.Hurter FABACEAE	Sayal	Gum	0.60	Diarrhoea	Oral	Infusion
<i>Ziziphus mucronata</i> Willd. RHAMNACEAE	Sedar	Leaves	0.60	Skin diseases, hair fall	Topical	Paste
<i>Ziziphus spina-christi</i> (L.) Desf. RHAMNACEAE SHRUBS	Sider	Leaves and Bark	1.20	Wounds Mouth ulcers	Topical Oral	Paste Raw
<i>Aloe fleurentinorum</i> Lavranos and L.E.Newton ASPHODELACEAE	Azua	Leaves	1.40	Inflammation in eye and ear Wound healing	Optical Topical	Paste Paste
<i>Aloe officinalis</i> Forssk. ASPHODELACEAE	Sabbar	Leaves	1.40	Skin diseases	Topical	Paste
<i>Anisotes trisulcus</i> (Forssk.) Nees ACANTHACEAE	Almaz	Leaves	0.60	Snake bites	Topical	Raw
<i>Abrus bottae</i> Deflers FABACEAE	Alhimrar - tanub	Stem	1.20	Gum inflammation	Toothbrush	Infusion
<i>Acalypha fruticosa</i> Forssk. EUPHORBIACEAE	Alanam, Tafran	Leaves	1.40	Malaria	Oral	Paste
<i>Adenium obesum</i> (Forssk.) Roem. and Schult. APOCYNACEAE	Adan	Latex	0.80	Cuts and wounds	Topical	Paste
<i>Baccharoides schimperi</i> (DC.) Isawumi, El-Ghazaly and B.Nord. ASTERACEAE	Hijana	Leaves	0.60	Reduce pain	Topical	Burned
<i>Barleria trispinosa</i> (Forssk.) Vahl ACANTHACEAE	Hai Haman	Leaves	0.80	Chest congestion Mouth ulcers	Oral Nasal Oral	Raw Infusion
<i>Calotropis procera</i> (Ait.) R. Br. APOCYNACEAE	Oshur	Leaves	1.70	Rheumatism Wounds Toothache	Topical	Paste
<i>Capparis cartilaginea</i> Decne. CAPPARACEAE	Lasaf	Leaves	1.20	Pain and inflammation Kidney stones	Topical Topical Oral	Raw Maceration Raw
<i>Capparis spinosa</i> L. CAPPARACEAE	Warm	Leaves	1.20	Tumor	Topical	Paste
<i>Crossandra johanninae</i> Fiori ACANTHACEAE	Sayah	Stem	0.80	Stop excess bleeding from fresh wounds Diabetes Kidney stones	Topical Oral	Maceration Decoction Infusion
<i>Cynanchum forskaolium</i> Meve and Liede APOCYNACEAE	Reedah	Stem	1.20	Kidney stones	Oral	Decoction Infusion
<i>Desmidorchis retrospiciens</i> Ehrenb. APOCYNACEAE	Ghulthin Galab	Stem Milky Latex	1.60	Skin itching Wounds	Topical	Paste Paste
<i>Dodonaea viscosa subsp. angustifolia</i> (L.f.) J.G.West SAPINDACEAE	Alshath	Leaves	1.20	Allergy Gum inflammation Fractures Bruises and wounds	Topical Toothbrush	Infusion Raw Paste Paste
<i>Dorstenia foetida</i> Schweinf. MORACEAE	faliq baer	Stem	1.80	Leishmaniasis and Cutaneous diseases	Topical	Paste
<i>Ecbolium viride</i> (Forssk.) Alston ACANTHACEAE	Mudid--Muziz	Leaves	0.60	Snakebite	Topical	Paste
<i>Euphorbia ammak</i> Schweinf. EUPHORBIACEAE	Ealajin(eilki)-eamqaa	Milky latex	0.80	Leishmaniasis	Topical	Paste
<i>Euphorbia cactus</i> Ehrenb. ex Boiss. EUPHORBIACEAE	Karath	Milky latex	0.70	Leishmaniasis	Topical	Paste
<i>Ficus palmata</i> Forssk. MORACEAE	Alhomat Alharamy	Milky latex	0.40	Removing the thorns	Topical	Paste
<i>Grewia tenax</i> (Forssk.) Fiori MALVACEAE	Alnabe	Seeds	0.80	Anemia	Oral	Infusion
<i>Hibiscus deflersii</i> Schweinf. ex Cufod. MALVACEAE	Alkhabaya	Leaves	0.90	Hair growth	Topical	Infusion
<i>Indigofera articulata</i> Gouan FABACEAE	Khedish	Leaves	0.40	Wound	Topical	Paste
<i>Indigofera coerulea</i> Roxb. FABACEAE	Hassar Wasma	Leaves	0.60	Hair dye	Topical	Paste
<i>Indigofera spinosa</i> Forssk. FABACEAE	Alhal - Hellah	Thorns	0.40	Treatment for large warts	Topical	Raw
<i>Jasminum grandiflorum</i> L. OLEACEAE	Aloloq - Alyasmin albarry	Leaves	0.80	Mouth ulcers		Raw
<i>Kleinia pendula</i> (Forssk.) DC. ASTERACEAE	Lahab	Stem	1.20	Ear infection Inflammation and body pain	Topical	Juice Paste
<i>Lavandula coronopifolia</i> Poir. LAMIACEAE	Wazha Thufaira'a	Leaves	1.30	Eczema	Topical	Paste Paste
<i>Leptadenia pyrotechnica</i> (Forssk.)Decne. APOCYNACEAE	Marakh	Stem	1.20	Cuts and wounds	Topical	Paste
<i>Lycium shawii</i> Roem. and Schult. SOLANACEAE	Aleawsaj	Roots	0.60	Conjunctivitis	Topical	Juice
<i>Orbea wissmannii</i> (O.Schwartz) Bruyns APOCYNACEAE	Atbay alkalbah	Stem	0.50	Diabetes	Oral	Raw
<i>Plectranthus asirensis</i> J.R.I. Wood	Ashar	Leaves	1.20	Acidity and chest	Oral	Raw

LAMIACEAE					congestion Sterilizer and disinfectant for children after defecation Mouth ulcers Children's skin infections	Topical Oral Topical	Maceration Raw Juice
<i>Plumbago zeylanica</i> L. PLUMBAGINACEAE	Heja	Root	0.70	Localized body pain	Topical		Paste
<i>Psiadia punctulata</i> (DC.) Vatke ASTERACEAE	Fatha- Altebaq Al Fatah	Leaves and Stem	1.20	Muscle sprain Hypocitraturia Bone fracture	Topical Oral Topical		Maceration Infusion
<i>Pyrostria phyllanthoidea</i> (Baill.) Bridson RUBIACEAE	Samah	Leaves	0.80	Burns	Topical		Paste
<i>Rumex nervosus</i> Vahl. POLYGONACEAE	Othrob	Leaves	1.60	Muscle pain Tonsillitis Acidity Diabetes Mellitus	Topical Topical Oral Oral		Infusion Paste Raw Juice
<i>Sageretia thea</i> (Osbeck) M.C.Johnst. RHAMNACEAE	Amstmakh - Neem	Leaves	0.60	Burns	Topical		Paste
<i>Salvadora persica</i> L. SALVADORACEAE	Arak	Root	1.90	Gum inflammation	ToothBrush		Paste
<i>Tarchonanthus camphoratus</i> L. ASTERACEAE	Affar	Tender twigs with leaves	1.30	Sores and allergic effects on the anal part of young babies	Topical		Paste
<i>Withania somnifera</i> (L.) Dunal SOLANACEAE	Obab	Leaves	1.20	Wound Swellings	Topical		Paste Paste
<i>Aerva javanica</i> (Burm.F.) Juss. ex Schult. HERBS	Arwa	Leaves	1.50	Skin disease	Topical		Paste
<i>Blepharis edulis</i> (Forssk.) Pers. ACANTHACEAE	Zaghf	Seeds	0.90	Wounds	Topical		Paste
<i>Chenopodium fasciculosum</i> Aellen AMARANTHACEAE	Mafrathah	Leaves	0.60	Pain and Abscess	Topical		Paste
<i>Cissus quadrangularis</i> L. VITACEAE	Salaa	Leaves	1.40	Treatment for circumcision wounds	Topical Oral		Paste Decoction
<i>Cissus rotundifolia</i> Vahl VITACEAE	Gholf	Leaves	1.45	Stomach disorders Cold Influenza	Oral		Decoction
<i>Citrullus colocynthis</i> (L.) Schrad. CUCURBITACEAE	Alhanzal	Fruits	0.80	Corns and calluses	Topical		Maceration
<i>Clematis hirsuta</i> Perr. and Guill. RANUNCULACEAE	Habayin (alzayan)	Stem	0.80	Jaundice	Topical		Paste
<i>Ceropegia aristolochioides</i> Decne. APOCYNACEAE	Ghaqa	Stem	0.60	Snake or scorpion bites	Topical		Paste
<i>Corchorus depressus</i> (L.) Stocks MALVACEAE	Molohiya	Leaves	0.80	Urinary disorders	Oral		decoction
<i>Crotalaria incana</i> L. FABACEAE	-Hijah om hasasiah - qalqal	Leaves	0.60	Eczema	Topical		Paste
<i>Enicostema axillare</i> (Poir. ex Lam.) A.Rayna GENTIANACEAE	Heja om aniab	Leaves	0.70	Tooth infection	Oral		Raw
<i>Euphorbia granulata</i> Forssk. EUPHORBIACEAE	Hijah om qab	Leaves	0.60	Dermatophytes	Topical		Paste
<i>Fagonia schweinfurthii</i> (Hadidi) Nabil and Hadidi ZYGOPHYLLACEAE	Herb Madina, Hadadi	Stem	1.20	Infection of the Urethra	Oral		Decoction
<i>Lindenbergia indica</i> (L.) Vatke OROBANCHACEAE.	Nawra	Leaves	0.60	Wounds Diabetic ulcers Bed sores Mouth ulcers	Topical		Juice Raw
<i>Oxalis corniculata</i> L. OXALIDACEAE	Makrasah - Mahmadah	Leaves	0.60	Gum inflammation	Chewing		Raw
<i>Oxygonum sinuatum</i> (Hochst. and Steud ex Meisn.) Dammer POLYGONACEAE	Alqutbah alqayimah	Leaves	0.40	Renal calculi	Oral		Infusion
<i>Pelargonium multibracteatum</i> Hochst. ex A. Rich. GERANIACEAE	Hija Amlos	Leaves	0.60	Tonsillitis	Topical		Paste
<i>Pergularia tomentosa</i> L. APOCYNACEAE	Ghalqa	Milky latex	0.50	Leishmaniasis	Topical		Paste
<i>Portulaca oleracea</i> L. PORTULACACEAE	Regila, Maregila	Leaves	1.20	Insomnia Headache Acidity	Topical Oral		Paste Decoction
<i>Pulicaria jaubertii</i> E.Gamal-Eldin ASTERACEAE	Sakab	Twig	0.60	Joint Pain and Rheumatism	Oral		Decoction
<i>Reichardia tingitana</i> (L.) Roth ASTERACEAE	muqbaba	Leaves Stem	0.70	Diabetes	Oral		
<i>Senna alexandrina</i> Mill. FABACEAE	Eshriq	Leaves	1.20	Laxative and gas trouble	Oral		Infusion
<i>Solanum incanum</i> L. SOLANACEAE	.Noquom	Fruits Roots	1.20	Muscle sprain Tooth decay Cough	Topical Topical Oral		Paste Decoction Maceration
<i>Sonchus asper</i> (L.) Hill ASTERACEAE	Almoqbabah alkaberah -Eiltifaf	Leaves	0.60	Body pain	Topical		Juicec
<i>Talinum portulacifolium</i> (Forssk.) Asch. ex Schweinf. PORTULACACEAE	Herwah	Leaves	0.40	Treatment for hair problems and polishing:	Topical		Infusion

<i>Tribulus parvispinus</i> C.Presl ZYGOPHYLLACEAE	Kotba	Leaves	0.80	Kidney stone	Oral	Decoction
<i>Trichodesma trichodesmoides</i> (Bunge) Gürke BORAGINACEAE	Lesanah	Leaves	0.60	Leishmaniasis	Topical	Paste
<i>Zaleya pentandra</i> (L.) C.Jeffrey AIZOACEAE	Atala- thafla	Leaves	0.40	Tonsillitis	Topical	Maceration

During the present study, 34 plants have been noted with unrecorded medicinal properties and reported here for the first time. The present study also contributes to the documentation of new medicinal plants such as *Pyrostria phyllanthoidea* and *Chenopodium fasciculosum*. The thorough literature search states that both of the plants have

not been reported so far with any medicinal attributes. Regarding the families of medicinal plants represented Fabaceae is the dominant family represented by 11 species of medicinal plants followed by Apocynaceae (8 species), Asteraceae (7 species), Acanthaceae (5 species), Euphorbiaceae (5 species) and Moraceae (4 species) (Fig. 2).

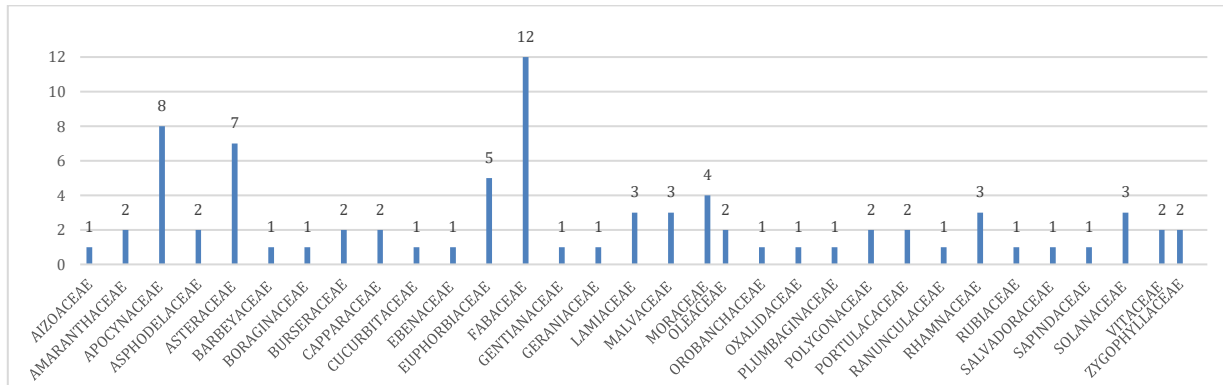


Fig. 2: Families of medical plants represented

Among the genera of medicinal plants documented *Vachellia* is the dominant genus represented by 4 species followed by *Euphorbia*, *Ficus*, *Indigofera* (3 species each) *Aloe*, and *Capparis*. *Cissus*, *Commiphora*, and *Ziziphus* (2 species each).

The medicinal plants represented various growth forms. Most of them observed from the study area are shrubs (40 species) followed by herbs (24 species), trees (14 species) and climbers (5 species) (Fig. 3).

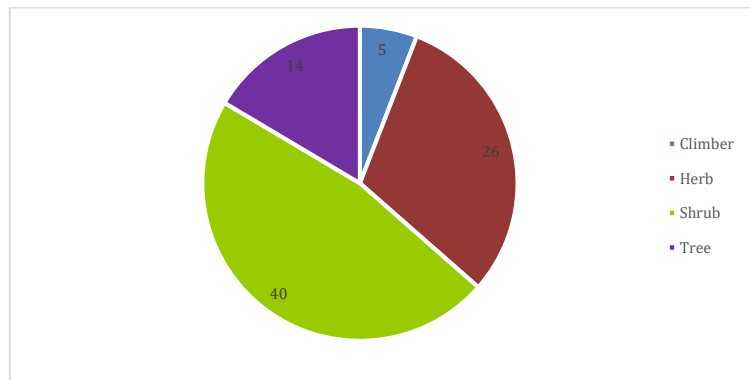


Fig. 3: Habit (Growth forms) of medicinal plants

Various parts of medicinal plants have been used for preparing various traditional medicines. The most observed parts are leaves represented by 51

species, followed by stem (16 species), roots (5 species), latex (5 species), bark, and fruits (3 species) (Fig. 4).

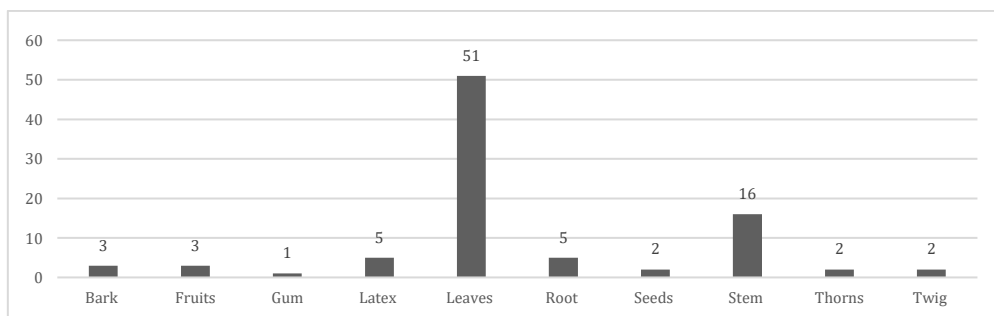


Fig. 4: Parts of medical plants used

Regarding the medicinal plants against treating various ailments, there are 14 species recorded for treating cuts and wounds. Other notable ailments are mouth ulcers (6 species), diabetes and Leishmaniosis (5 species each), cold and gum inflammation (4 species each); Kidney stones, Snake bites, Stomach problems, and Tonsillitis (3 species

each). Regarding the mode of preparations mostly collect plant parts and ground into a paste (49 preparations) followed by raw (19 preparations), infusion (18 preparations), decoction (11 preparations), maceration (8 preparations), juice (6 preparations) and burned (2 preparations) (Fig. 5).

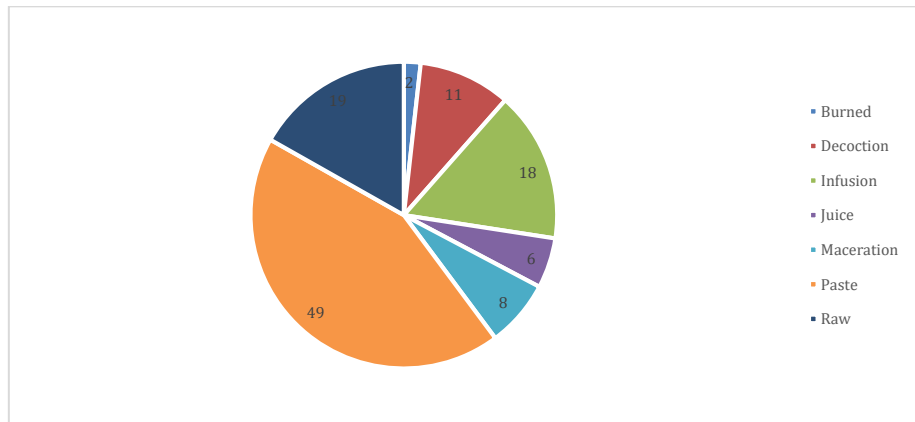


Fig. 5: Mode of preparation of medicinal plants

There are different routes of administration have been noticed such as Topical (64 preparations), Oral

(37 preparations), Toothbrush (6 preparations), Nasal and Optical (1 preparation each) (Fig. 6).

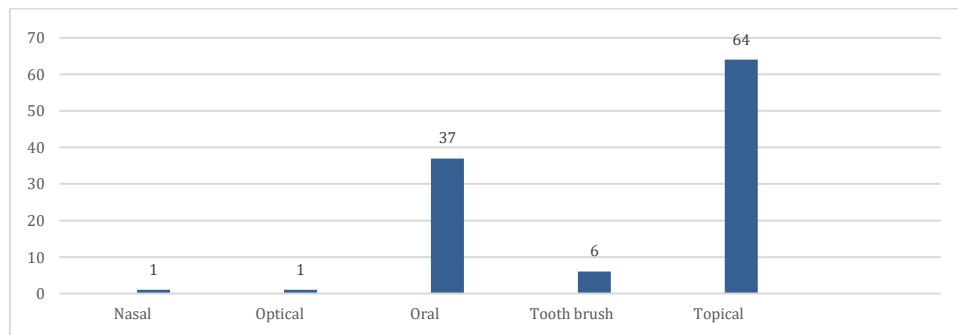


Fig. 6: Route of administration

It has been noted that *Salvadora persica* is the most useful species which accounted for a use value of 1.9 (Table 1). Other important medicinal plants with high use value are *Dorstenia foetida* (1.80), *Calotropis procera* (1.80), *Rumex nervosus* (1.60), *Desmidorchis retrospiciens*(1.60), *Cissus rotundifolia* (1.45), *Cissus quadrangularis*, *Aloe officinalis*, *Aloe fleurentinorum*, *Acalypha fruticosa*, *Commiphora*

gileadensis and *Tamarindus indica* (1.40 each) (Table 1). For calculating informant consensus factor (FIC) in relation to various ailment categories 48 use reports were observed for cuts and wounds followed by Skeleto-muscular system disorders(47 use reports), Dermatological disorders (44 use reports), Gastro-intestinal disorders (43 use reports), Endocrinal disorders (42 use reports) (Table 2).

Table 2: Informant consensus index for traditional medicinal plant use categories

Ailment category	Number of use-reports (Nur)	Number of taxa (Nt)	Informants' consensus factor (FIC)
Dental care	32	12	0.60
Dermatological disorders	44	16	0.65
Skeleton-muscular system disorders	47	16	0.67
Cuts and wounds	48	16	0.68
General Health	12	3	0.81
Liver problem	12	3	0.81
Respiratory Disease	12	3	0.81
Ear Nose Throat problem	28	6	0.81
Hair care	26	5	0.84
Genito urinary ailments	36	6	0.85
Cardiovascular disorders	9	2	0.87
Urinal disorders	17	3	0.87
Fever	18	3	0.88
Poisonous bite	18	3	0.88
Gastro-intestinal disorders	43	6	0.88
Endocrinal disorders	42	5	0.90

During the present study, it has been noted that endocrinal disorders have with high Fic value (0.90) followed by Gastrointestinal disorders, poisonous bite, and fever (0.88 each). The lowest value was observed for dental care (0.60). Regarding Fidelity 42 species are observed with 100% which indicates a high preference among the informants to treat particular ailments (Table 1).

4. Discussion

The detailed analysis of the 83 species of native medicinal plants among the people of the mountain of Jazan region reveals the rich tradition of the people who preserve such invaluable knowledge through hundreds of years. The result of the present study was compared with the published literature from other parts of Saudi Arabia was compared and most of the publications deal with raw drugs collected from markets and cultivated medicinal plants (Ullah et al., 2020; Al-Said, 1993; Al-Harbi, 2017; Bajrai, 2010; Alqethami and Aldhebiani, 2021). The native plants were mostly covered in the studies of Rahman et al. (2004), Aati et al. (2019), and Qari et al. (2021).

In the course of the present investigation, two medicinal plant species, namely *Pyrostria phyllanthoidea* and *Chenopodium fasciculosum*, have been identified as novel additions to the global medicinal flora. *Pyrostria phyllanthoidea*, a shrub categorized within the Rubiaceae family, exhibits a restricted distribution to the rocky mountainous terrain of Al Aridhah. The indigenous application involves the application of a leaf paste to alleviate burns and ulcers, as documented by previous studies (West et al., 2009; Pradhan et al., 2021). However, it is imperative that comprehensive phytochemical and pharmacological analyses be conducted to substantiate the presence of active constituents and elucidate the underlying mechanisms of action.

Chenopodium fasciculosum, on the other hand, is an herb belonging to the Amarathaceae family and is found in mountainous regions. Indigenous communities have traditionally employed leaf paste derived from this plant to alleviate pain and abscesses. Notably, other species within the *Chenopodium* genus have been documented to contain a plethora of bioactive compounds, including phenols, flavonoids, tannins, saponins, terpenoids, coumarins, steroids, and anthraquinones (Khan et al., 2019). These constituents have been associated with diverse medicinal properties, encompassing antibacterial effects, amelioration of digestive disorders, mitigation of sterility, anxiolytic potential, and anti-hypertensive activity. Nevertheless, it is imperative that rigorous phytochemical and pharmacological investigations be undertaken to corroborate the presence of active principles and elucidate the precise mechanisms of action inherent to these recently discovered medicinal plant species.

Regarding the families of the medicinal plants documented Fabaceae is the dominant family represented followed by Apocynaceae, Asteraceae,

Acanthaceae, Euphorbiaceae, and Moraceae. Fabaceae is found amongst the five botanical families richest in therapeutic properties (Asfaw and Abebe, 2021; Leal et al., 2000). In comparison with other studies from Saudi Arabia also in line with the same families (Aati et al., 2019; Al-Asmari et al., 2017). Shrubs are the most observed growth forms and in the arid climate of Saudi Arabian mountains shrubs are the most survived growth forms, similar observations were made by Abulafatih (1987) and Tounekti et al. (2019). The Leaves are the most used parts for the preparation of traditional medicines. leaves are easily accessible and rich in various phytochemicals such as tannins, glycosides, alkaloids, and saponins. Similar observations are made by Alqethami et al. (2020).

During this study most observed mode of preparation is paste and it is a very easy method of preparation and found to be an effective treatment in Saudi Arabian traditional medicine. The consumption of medicinal plant parts as raw is also observed. The other methods like infusion and decoction need more time and care (Alqethami et al., 2020). The most frequent route of administration is Topical and similar observations were noted by Alqethami et al. (2020).

Salvadora persica stands out as the most invaluable botanical species in this context, demonstrating a noteworthy use value of 1.9. Notable among the roster of significant medicinal plants are *Dorstenia foetida*, *Calotropis procera*, *Rumex nervosus*, *Desmidorchis retrospiciens*, *Cissus rotundifolia*, *Cissus quadrangularis*, *Aloe officinalis*, *Aloe fleurentinorum*, *Acalypha fruticosa*, *Commiphora gileadensis*, and *Tamarindus indica* (Abdul et al., 2019).

For calculating informant consensus factor (FIC) in relation to various ailment categories 48 use reports were observed for cuts and wounds followed by Skeleto-muscular system disorders (47 use reports), Dermatological disorders (44 use reports), Gastro-intestinal disorders (43 use reports), Endocrinal disorders (42 use reports) (Table 2). During the present study, it has been noted that endocrinal disorders have with high Fic value (0.90) followed by Gastrointestinal disorders, poisonous bite, and fever (0.88 each). The lowest value was observed for dental care (0.60). Regarding Fidelity 42 species are observed with 100% which indicates a high preference among the informants to treat particular ailments.

5. Conclusion

The present study was an attempt to document and preserve the traditional knowledge of the local people who live in the mountains of the Jazan region. Out of the 83 medicinal plants recorded 34 plants have been noted with unrecorded medicinal properties and new reports of so far unknown medicinal plants such as *Pyrostria phyllanthoidea* and *Chenopodium fasciculosum*. These data indicate that the people of the mountains of the Jazan region

live with sound knowledge of medicinal plants and possess good traditions to preserve their knowledge. The average value of the informant consensus factor (FIC) was 0.80 which shows their unique and unshared knowledge. It is noted that the younger generation in the study area is reluctant to the traditional health care practices and they have minimum knowledge of traditional medicinal plants. Depletion of traditional knowledge among the people is serious because of the disinterest of the young generation to gain knowledge, oral-based knowledge transfer, unavailability of the species, and the influence of modern education. Therefore, awareness should be given to the importance of traditional medicinal plants among the young generation of the study area. The overall analysis reveals the major uses of medicinal plants for the treatment of different diseases ranging from simple to fatal diseases. The plants noted with unreported medicinal attributes and other potential medicinal plants should be considered for detailed phytochemical and pharmacological studies for validation and authentication of various medicinal properties followed by developing new drug leads.

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Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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