Exploring the rich ethnobotanical heritage: Medicinal plant uses in Taif city, Saudi Arabia

Amal Y. Aldhebiani[1,2]* Sahar M. Alnefaie[1]

[1] Department of Biological Sciences, Faculty of Science, King Abdulaziz University, Jeddah, Saudi Arabia
[2] Princess Doctor Najla Bint Saud AL Saud Distinguished Research Center for Biotechnology, King Abdulaziz University, Jeddah, Saudi Arabia

*Corresponding author: Amal Y. Aldhebiani, Department of Biological Sciences, Faculty of Science, King Abdulaziz University, Jeddah, Saudi Arabia; E-mail: info@paperlyst.com

Abstract

Ethnobotany focuses on documenting and preserving traditional knowledge about medicinal plants. This study aimed to document the ethnobotanical use of medicinal plants in Taif City, Saudi Arabia to preserve both the expertise and the plants. A survey conducted from July 2019 to August 2020, involving 384 informants, identified 68 plant species across 33 families. The most cited families were *Lamiaceae*, *Apiaceae*, and *Asteraceae*. The most frequently mentioned plant species was Anise *(Pimpinella anisum L.)*, accounting for 12% of the citations. Gastrointestinal diseases were the most frequently cited ailments, which explains the high use of Anise. The study highlighted the extensive use of plants for medicinal purposes, with 64% of participants using them regularly. Leaves were the most often utilized plant parts, making up 34% of the total, and the most common way of preparation was decoction, accounting for 37% of the cases. The results underscore the importance of conserving ethnobotanical knowledge as a foundation for future medical research and biodiversity conservation.

Keywords: Traditional medicine, Herbal medicine, Ethnobotany, Antioxidant, Knowledge

Introduction

The interest in traditional medicine has significantly increased over the past few years. According to the World Health Organization (WHO), 80% of the world's population relies on traditional medicine, defined as the totality of knowledge, skills, and practices based on indigenous theories, beliefs, and experiences used in health maintenance and disease treatment (Azaizeh et al., 2003). Herbal medicine, the most widely used form of traditional medicine, involves approximately 25,000 to 75,000 plant species globally (Eshete et al., 2016). Traditional medicine is particularly prevalent in low and middle-income nations due to its accessibility and affordability (WHO 2004). Recent studies emphasize the importance of documenting ethnobotanical knowledge to support the discovery of new therapeutic compounds and the sustainable use of plant resources (Nguyen et al., 2023; Ali et al., 2024). In Saudi Arabia, ethnobotanical studies have documented the rich traditional use of medicinal plants across various regions (Abulafatih, 1987; Al-Said, 1993; El-Ghazali et al., 2010). However, modernization threatens to erode this valuable knowledge. This study aims to document the

ethnobotanical use of medicinal plants in Taif City, Saudi Arabia, thus preserving this knowledge for future generations and potential scientific research.

Materials and Methods

Study area

Taif City, located in the Makkah Region of western Saudi Arabia Fig 1, is known for its favorable climate and production of high-value Rose oil from *Rosa madascena* (Aldhebiani & Yaslam, 2023). The city spans an area of approximately 13,840 km² and has a population of 689,916 with a growth rate of 2% per annum (Statistics, 2020; Alharthi & El-Damaty, 2022).
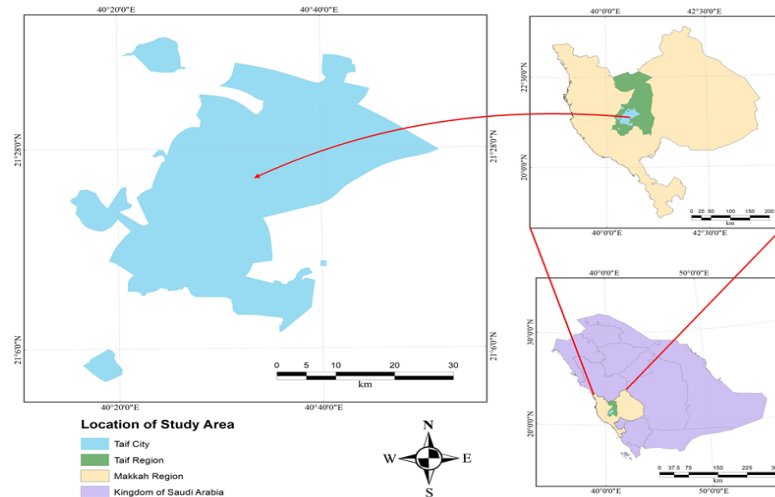
Figure 1. Geographical location for Taif City (Alharthi & El-Damaty, 2022)

Data collection

Ethnobotanical data were collected from July 2019 to August 2020 using semi-structured interviews and online questionnaires due to COVID-19 restrictions. A total of 384 informants participated, with data recorded in Arabic and later analyzed using descriptive statistical methods. Ethical approval was obtained from the Unit of Biomedical Ethics Research Committee at King Abdulaziz University.

Data analysis

Data were compiled and summarized in an Excel spreadsheet, categorizing plant use into 19 disease categories based on the Saudi Ministry of Health's classification. The relative frequency of plant families, species, parts used, and preparation methods were calculated. The informant consensus factor (Fic) was used to assess the cultural importance of each species.

Results

Demographic profile of informants

The survey included 384 respondents, 60% of whom were women and 40% men. The majority of participants were aged between 35 years-44 years (33%), followed by those aged 25 years-34 years (28%). The lowest percentage was for those

aged 65 years-74 years (3%) and above (1%) (Tab 1-3). The majority of participants (93%) used medicinal plants for health purposes, either regularly (64%) or occasionally (32%) (Fig 2-4).

Table 1. Demographic profile of all informants

Item	Demographic feature	No. of informants	Percentage
Gender	Female	229	60%
	Male	155	40%
	Total	384	100%
Age	15 years-24 years	46	12%
	25 years-34 years	109	28%
	35 years-44 years	128	33%
	45 years -54 years	70	18%
	55 years-64 years	16	4%
	65 years-74 years	12	3%
	75 years-84 years	3	1%
	85 years and above	0	0
	Total	384	100%

Table 2. Comparison demographic profile of informants

Item	Demographic feature	No. of informants in interviews	Percentage	No. of informants in online surveys	Percentage
Gender	Female	21	84%	208	58%
	Male	4	16%	151	42%
	Total	25	100%	359	100%
Age	15 years-24 years	0	0	46	13%
	25 years-34 years	1	4%	108	30%
	35 years-44 years	2	8%	126	35%
	45 years-54 years	6	24%	64	18%
	55 years-64 years	5	20%	11	3%
	65 years-74 years	8	32%	4	1%
	75 years-84 years	3	12%	0	0
	85 years and above	0	0	0	0
	Total	25	100%	359	100%

Table 3. Sources of traditional medicinal plant knowledge

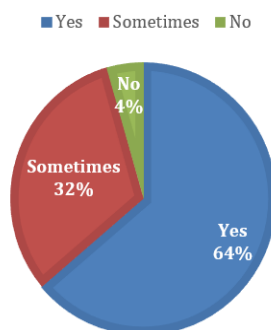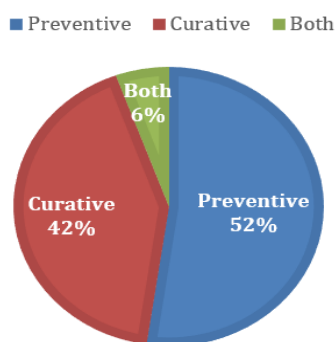| The Source	Frequency	Percentage
Elderly	93	24%
Family	117	30%
Friends	20	5%
Herbalist	13	3%
Physician	4	1%
Reading and research	124	32%
Others	13	3%
Total	384	100%

Figure 2. **Using medicinal plants**
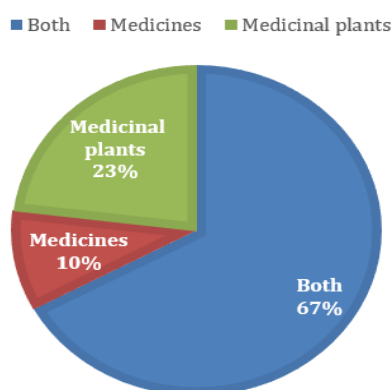

Figure 3. **The purpose of use**

Figure 4. **Preference for use**

Ethnobotanical use of medicinal plants

Tab 4 shows a Complete inventory of plants used by Saudi Arabians in Taif, including scientific names, vernacular names, family names, parts used, medicinal uses and relative frequency of species. It reveals that the study documented the use of 68 plant species across 33 families. The families with the highest frequency were *Lamiaceae* (10 species), *Apiaceae* (8 species), and *Asteraceae* (5 species) (Fig 5 and Tab 4). The most frequently cited plant species were *Pimpinella anisum L.* (Anise, 12%), *Mentha spicata L.* (Mint, 7%), and *Commiphora myrrha (Nees) Engl.* (Myrrha, 5%).

Table 4. Complete inventory of plants used by Saudi Arabians in Taif, including scientific names, vernacular names, family names, parts used, medicinal uses and relative frequency of species

Scientific Name	Family	Vernacular name	Part used	Medicinal use	The frequency	Percentage	Voucher no.
Allium cepa L.	Amaryllidaceae	onion	Bulb	Inflammations	3	0%	SN-1
Allium sativum L.	Amaryllidaceae	garlic	Bulb	Sore throat - hypertension - Intestinal catarrh - for immune-strengthening	21	2%	SN-2
Aloe vera (*L.*) Burm.f.	Asphodelaceae	Aloe vera	Latex	Dermatitis - Eczema – Acne	20	2%	SN-3
Ammi visnaga (*L.*) Lam.	Apiaceae	The seed of shame	Seeds	Renal calculi	1	0%	SN-4
Anastatica hierochuntica L.	Brassicaceae	Maryam's palm	whole plant	Dystocia (Facilitate childbirth)	1	0%	SN-5
Aucklandia costus Falc.	Asteraceae	Indian installment	Root	Sinusitis - Thyroid disorders	15	2%	SN-6
Artemisia maritima L.	Asteraceae	Artemisia	Leaves	Colic - Intestinal catarrh – Brucellosis	9	1%	SN-7
Avena sativa L.	Poaceae	oats	Seeds	Lethargy and laziness	2	0%	SN-8
Boswellia sacra Flückiger-Dupiron	Burseraceae	Luban Al Shehri	Resin	Wounds - Cough - Respiratory tract infections – Sputum	21	2%	SN-9
Brassica oleracea var. capitata L.	Brassicaceae	Vineyard	Leaves	Irritable bowel syndrome	1	0%	SN-10
Camellia sinensis (*L.*) Kuntze	Theaceae	Green tea	Leaves	Antiflatulent	2	0%	SN-11
Cinnamomum cassia (*L.*) Presl	Lauraceae	cinnamon	Bark	Dysmenorrhea - Back pain - Hormones disorders - Prophylaxis of diabetes	27	3%	SN-12
Citrus aurantium L.	Rutaceae	an orange	Fruit	Cold - for immune-strengthening - Vitamin c deficiency	2	0%	SN-13
Citrus limon (*L.*) Burm. fil.	Rutaceae	Lemon	Fruit	Vitamin c deficiency - Cold - Nasal congestion - irritable bowel syndrome	8	1%	SN-14
Coffea arabica L.	Rubiaceae	Bin Arabi	Seed's peel	Dysuria (Diuretic) - Digestive tract cleanse	1	0%	SN-15
Commiphora myrrha (Nees) Engl.	Burseraceae	die	Resin	Wounds - dental inflammation - Hyperglycemia - Sore throat	51	5%	SN-16
Coriandrum sativum L.	Apiaceae	coriander	Seeds-Leaves	Hypercholesterolemia - Obesity – Contraceptive	3	0%	SN-17
Cuminum cyminum L.	Apiaceae	cumin	Seeds	Colic - Intestinal catarrh - irritable bowel syndrome - Flatulent dyspepsia	47	5%	SN-18
Curcuma longa L.	Zingiberaceae	turmeric	Rhizome	Osteoporosis – Inflammations	16	2%	SN-19
Cymbopogon schoenanthus (*L.*) Spreng.	Poaceae	Al-Adhkhir	Whole plant	Sinusitis - Diabetes – Colic	2	0%	SN-20
Dodonaea viscosa (*L.*) Jacq.	Sapindaceae	six	Leaves	Jaundice	1	0%	SN-21
Eruca vesicaria (*L.*) Cav.	Brassicaceae	watercress	Leaves	Hair loss	1	0%	SN-22
Fagonia bruguieri DC.	Zygophyllaceae	Shakaa	Leaves	Brucellosis	1	0%	SN-23

Ferula assa-foetida L.	Apiaceae	Asafoetida	Resin	Headache - Migraine	5	1%	SN-24
Foeniculum vulgare **Mill.**	Apiaceae	Fennel	Seeds	Colic - Sore throat - irritable bowel syndrome - Flatulent dyspepsia - Obesity - Body lift	43	5%	SN-25
Hibiscus sabdariffa L.	Malvaceae	Roselle	Flowers-Leaves	Hypertension	7	1%	SN-26
Hordeum vulgare L.	Poaceae	barley	Seeds	Urinary tract infection	3	0%	SN-27
Lactuca sativa L.	Asteraceae	wheezing	Leaves	Gastro esophageal reflux disease	2	0%	SN-28
Lavandula atriplicifolia **Benth.**	Lamiaceae	lavender	Flowers	Dyspepsia	6	1%	SN-29
Lawsonia inermis L.	Lythraceae	Henna	Leaves	For hair health	1	0%	SN-30
Lepidium sativum L.	Brassicaceae	Cress love	Seeds	Back pain - Arthritis - Osteoporosis - Broken bone – Plague	47	5%	SN-31
Linum usitatissimum L.	Linaceae	Flaxseed	Seeds	Colic	5	1%	SN-32
Matricaria aurea (*L.*) **Sch.Bip.**	Asteraceae	chamomile	Flowers	Cold - Sedative – Sinusitis	38	4%	SN-33
Melissa officinalis L.	Lamiaceae	Melissa	Leaves	Hypertension	2	0%	SN-34
Mentha spicata L.	Lamiaceae	mint	Leaves	Cold - Dyspepsia - irritable bowel syndrome - Dysmenorrhea - Flatulent dyspepsia	63	7%	SN-35
Moringa oleifera Lam.	Moringaceae	Moringa	Whole plant	Irritable bowel syndrome	9	1%	SN-36
Nigella sativa L.	Ranunculaceae	habat al Baraka	Seeds	Sore throat – Sinusitis	44	5%	SN-37
Ocimum americanum L.	Lamiaceae	Basil	Leaves	Colic - Intestinal catarrh	4	0%	SN-38
Ocimum basilicum L.	Lamiaceae	basil	Leaves	Constipation	6	1%	SN-39
Onosma echioides (L.) L.	Boraginaceae	Khoa Goa - the leg of a pigeon	Root	Burns	3	0%	SN-40
Opuntia ficus-indica (L.) Mill.	Cactaceae	Figs	Fruit	Constipation	2	0%	SN-41
Origanum syriacum L.	Lamiaceae	Marjoram	Leaves	Hormones disorders	21	2%	SN-42
Petroselinum crispum (Mill.) Fuss	Apiaceae	parsley	Leaves	Renal calculi	13	1%	SN-43
Pimpinella anisum L.	Apiaceae	anise	Seeds	Flatulent dyspepsia - Cough - Colic - Cold - irritable bowel syndrome	109	12%	SN-44
Piper nigrum L.	Piperaceae	Black pepper	Seeds	Flatulent dyspepsia	1	0%	SN-45
Pistacia lentiscus L.	Anacardiaceae	drunk	Resin	Cold	3	0%	SN-46
Plectranthus aegyptiacus (Forssk.) C.Chr.	Lamiaceae	The char	Leaves	Sore throat - Allergies – Otitis	5	1%	SN-47
Prunus mahaleb L.	Rosaceae	mahaleb	Seeds	Allergies	1	0%	SN-48
Psiadia punctulata (DC.) Oliv. & Hiern ex Vatke	Asteraceae	plate	Leaves	Broken bone - Tendinitis - Herniated disk	19	2%	SN-49
Psidium guajava L.	Myrtaceae	Guava	Leaves	Sore throat – Cough	24	3%	SN-50
Punica granatum L.	Lythraceae	pomegranate	Peel	Peptic ulcer	11	1%	SN-51

|							
Rhazya stricta Decne.	Apocynaceae	Harlem	Seeds	Cerebral hemorrhage	1	0%	SN-52
Salvia officinalis L.	Lamiaceae	Sage	Leaves	Gingivitis - Headache - Colic – Gastritis	22	2%	SN-53
Salvia rosmarinus Schleid.	Lamiaceae	Rosemary	Leaves	Constipation - hair health	9	1%	SN-54
Senegalia senegal (L.) Britton	Fabaceae	Gum arabic	Resin	Back pain - irritable bowel syndrome	2	0%	SN-55
Senna alexandrina Mill.	Fabaceae	Snamaki	Leaves	Constipation - irritable bowel syndrome	8	1%	SN-56
Sesamum indicum L.	Pedaliaceae	sesame	Seeds	Cough	10	1%	SN-57
Syzygium aromaticum (L.) Merr. & Perry	Myrtaceae	clove	Seeds	Dental inflammation – Sinusitis	10	1%	SN-58
Tamarix aphylla (L.) Karst.	Tamaricaceae	Ethel	Leaves	Sore throat	3	0%	SN-59
Thuja standishii (Gordon) Carrière	Cupressaceae	Tannins	Seeds	Postpartum	2	0%	SN-60
Thymus vulgaris L.	Lamiaceae	Wild Thyme	Leaves	Cough	14	1%	SN-61
Trachyspermum ammi (L.) Sprague	Apiaceae	The nankha	Seeds	Vomiting - Colic - Intestinal catarrh	10	1%	SN-62
Tribulus terrestris L.	Zygophyllaceae	Al-Hasak	Seeds	Renal calculi	1	0%	SN-63
Trigonella foenum-graecum L.	Fabaceae	The ring	Seeds	Urinary tract infection - Colic - Gastritis - Vitamin d deficiency - Calcium deficiency - Tendon rupture - Bone strengthening	36	4%	SN-64
Vigna radiata (L.)R.Wilczek	Fabaceae	Almash	Seeds	Broken bone	3	0%	SN-65
Vitellaria paradoxa C.F.Gaertn.	Sapotaceae	Shea	Seeds	Obesity	4	0%	SN-67
Zingiber officinale Roscoe	Zingiberaceae	ginger	Rhizome	Sore throat - Cold - for immune-strengthening - Respiratory tract infection - Sciatica - Arthritis - Food poisoning	32	3%	SN-68
Ziziphus spina-christi (L.) Desf.	Rhamnaceae	Sidr	Leaves	Wounds healing - Allergies - Hair loos	22	2%	SN-69
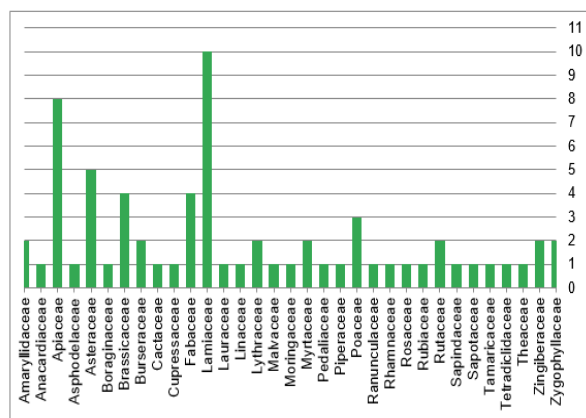
Figure 5. Relative frequency of plant families

Plant parts used

The most commonly used plant parts were leaves (34%), followed by seeds (23%), whole plants (15%), and fruits (10%). Other parts, such as roots, bark, and flowers, were used less frequently ([Fig 6](#)).
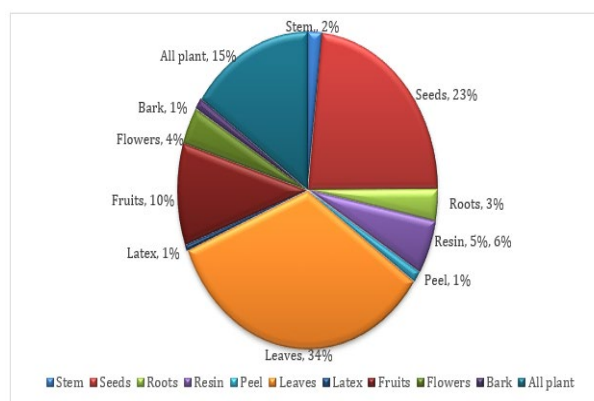

Figure 6. The most plant part used

Methods of preparation and use

The predominant methods of preparation were decoction (37%) and infusion (30%), followed by grinding (8%), mixing with honey (5%), bandaging and chewing (3%), and using as ointments and mixing with food (2%) ([Fig 7](#) and [Tab 5](#)).

Table 5. Mixtures and preparation methods

|	Therapeutic use	Mixture	Preparation method
Mix 1	Cerebral hemorrhage	Rashad (*Lepidium sativum L.*) - habat al Baraka (*Nigella sativa L.*) - coarse salt - olive oil - karkam (*Curcuma longa L.*) - helbah (*Trigonella foenum-graecum L.*) - mash (*Vigna radiata (L.)R.Wilczek*) - whole-wheat flour - warm water- harmal (*Rhazya stricta* Decne.)	Grounded and take a 1/4 cup of each of them, make a dough and divide the dough, Placed it in bags in the refrigerator. When used putting the bag of dough in hot water, wrapped the head in gauze, then put the dough then covered it with gauze for 4 hours a day, repeated daily for 14 days.
Mix 2	Sciatica	Zanjabeel (*Zingiber officinale* Roscoe.)-Lemon (*Citrus limon* (L.) Burm. fil.) - olive oil	It is mixed and then placed on all the leg and the thigh, then wrapped with a piece of fabric, used only during the night for a month.
Mix 3	Cardiovascular Diseases	Zanjabeel (*Zingiber officinale* Roscoe.)-olive oil-honey- garlic	Grinding it and then chew and eat.
Mix 4	Gangrene	Myrrha (*Commiphora myrrha* (Nees) Engl.)-honey	Grind and make a dough with honey then placed it on the wound for two days.
Mix 5	Tendon rupture	Helbah (*Trigonella foenum-graecum* L.)-egg-olive oil	Grind the *Trigonella foenum-graecum* L and mix with eggs and put on the injury place and then wrap with a cloth from night to morning, then wash and rup with olive oil, use it for a week.
Mix 6	Broken bone	*Psiadia punctulata* (DC.) Oliv. and Hiern ex Vatke-olive oil	*Psiadia punctulata* is heated with olive oil, then placed on the broken bone and wrapped for five days.
Mix 7	Cancer	*Allium sativum* L.- fat yogurt	Two cloves of garlic with two tablespoons of low-fat yogurt every day.
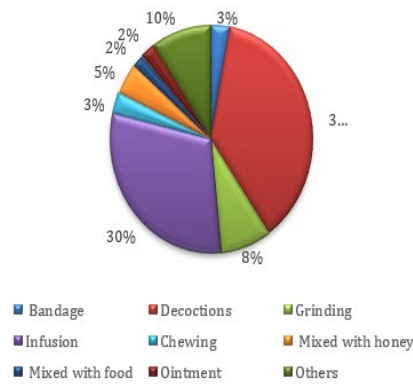
Figure 7. Methods of plants preparation and use

Informant Consensus Factor (Fic)

The Fic values were calculated to assess the cultural importance of plants and the agreement among informants on plant use for specific ailments. The highest Fic values were for orthopaedic illnesses (0.90), gastrointestinal illnesses (0.87), and endocrine illnesses (0.80), indicating a high level of agreement among informants. Gastrointestinal diseases were the most frequently cited ailments; with *Pimpinella anisum L.* being the most commonly used plant for these conditions.

Discussion

The present study indicates that traditional knowledge of medicinal plants is still prevalent in Taif City. The demographic profile shows higher participation of women, which aligns with previous studies indicating that women often possess more knowledge about medicinal plants due to their roles in household health care (Alqethami et al., 2020).

The high number of plant species from the *Lamiaceae* family reflects its wide use in traditional medicine, likely due to its known therapeutic properties, including antioxidant, antibacterial, and anti-inflammatory effects (Carović-Stanko et al., 2016). Recent research supports these findings, highlighting the role of *Lamiaceae* species in developing new therapeutic agents (Nguyen et al., 2023).

The prominence of *Pimpinella anisum L.* (Anise) in treating gastrointestinal disorders corroborates findings from (Abd El-Mawla et al., 2013, 2014), who reported its common use for digestive issues. Anise's effectiveness is supported by its documented antimicrobial, antifungal, and antiviral properties, contributing to its widespread use in traditional medicine (Shojaii & Abdollahi Fard, 2012).

The preference for using leaves and seeds can be attributed to their ease of preparation and high concentration of bioactive compounds. Leaves are often used for their direct application to ailments, while seeds are known for their preserved potency when stored (Fabricant & Farnsworth, 2001).

The high Fic values for certain disease categories, such as gastrointestinal and orthopedics illnesses, suggest a strong consensus among the local population regarding the effectiveness of specific plants for these conditions. This consensus indicates a rich and coherent body of traditional knowledge that has been preserved over generations. The high usage of *Pimpinella anisum* L. for gastrointestinal issues is supported by its therapeutic properties, which include antimicrobial, antifungal, and antiviral effects (Nguyen et al., 2023).

Similarly, the use of *Commiphora myrrha* (Myrrha) for wound healing and dental inflammation is consistent with its known antibacterial and antifungal properties, making it a valuable plant in traditional wound care and oral health (El-Ghazali et al., 2010). The cultural importance of these plants, as indicated by the high Fic values, emphasizes the need for

further pharmacological studies to validate and potentially integrate these traditional remedies into modern medicine (Heinrich et al., 1998).

Conclusion

This study provides a comprehensive documentation of the ethnobotanical use of medicinal plants in Taif City, Saudi Arabia. The findings highlight the rich traditional knowledge possessed by the local population and the therapeutic potential of the documented plants. The preservation of this knowledge is crucial for future medical research and biodiversity conservation. The study underscores the importance of integrating traditional and modern medicine to enhance healthcare outcomes and preserve cultural heritage.

Acknowledgments

The authors appreciate the contributions and support of the staff at King Abdulaziz University's herbarium. Additionally, we would like to thank all the participants both through interviews and online. No funding resources were available for this work. All expenses were from the author's side.

Data availability statement

All data is available in the manuscript.

Conflict of interest disclosure

The authors declare no conflict of interest.

Ethics approval statement

Ethics approval was received from King Abdulaziz University (KAU), Unit of Biomedical Ethics Research Committee, Ethics Committee (Reference No 450-21).

References

Aati H, El-Gamal A, Shaheen H, Kayser O. (2019). Traditional use of ethnomedicinal native plants in the Kingdom of Saudi Arabia. *J Ethnobiol Ethnomed*. **15:**2.

Abd El-Mawla AM, Albarrag A, Abdallah M. (2013). Herbal medicine use in a group Taif children, Saudi Arabia. *Spatula DD*. **3:**41-44.

Abd El-Mawla AM, Magd MS, Mahran S. (2014). Prevalence and indication of herbal medicine in digestive system disorders in Al-Taif area, Saudi Arabia. *Spatula DD*. **4:**127-130.

Aldhebiani AY, Yaslam WA. (2023). Flavonoid and antioxidant estimation in Rosa damascena growing in Taif and Al-Madinah cities, Saudi Arabia. *Pak J Bot Sci*. **55:**995-999.

Alharthi B, El-Damaty T. (2022). Study the Urban Expansion of Taif City Using Remote Sensing and GIS Techniques for Decision Support System. *Adv Remote Sens*. **11:**1-15.

Ali NA, Khalil EA, Kamil M. (2024). Ethnobotanical insights and conservation status of medicinal plants in Saudi Arabia. *J Herb Med*. **34:**100567.

Alqethami A, Hawkins JA, Teixidor-Toneu I. (2017). Medicinal plants used by women in Mecca: urban Muslim and gendered knowledge. J Ethnobiol Ethnomed. **13:**62.

Bussmann RW. (2012). Reflections on the life and legacy of Richard Evans Schultes. *Plant Sci Bull*. **57:**66.

Carović-Stanko K, PeteK M, Grdiša M, Pintar J, Bedeković D, Satovic Z. (2016). Medicinal plants of the family Lamiaceae as functional foods−a review. *Czech J Food Sci*. **34:**377-390.

El-Ghazali GE, Al-Khalifa KS, Saleem GA, Abdallah EM. (2010). Traditional medicinal plants indigenous to Al-Rass province, Saudi Arabia. *J Med Plants Res*. **4:**2680-2683.

Fabricant DS, Farnsworth NR. (2001). The value of plants used in traditional medicine for drug discovery. *Environ Health Perspect*. **109:**69-75.

Heinrich M, Ankli A, Frei B, Weimann C, Sticher O. (1998). Medicinal plants in Mexico: Healers' consensus and cultural importance. *Soc Sci Med*. **47:**1859-1871.

Nguyen QV, Nguyen LT, Tran QH, Le DM. (2023). Recent advances in the pharmacological activities of Lamiaceae family plants. *J Ethnopharmacol*. **295:**115342.

Shojaii A, Abdollahi Fard M. (2012). Review of pharmacological properties and chemical constituents of Pimpinella anisum. *ISRN Pharm*. **2012**:1-8.