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An Ethnobotanical Review of Medicinal Plants Traditionally Used for Diabetes Management in Southern Iran

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ABSTRACT

Diabetes is a chronic and rapidly growing global health concern. In regions rich in ethnobotanical knowledge, the use of medicinal plants plays a vital role in the management of this disease. Ethnobotanical investigations are particularly valuable for identifying plant species with therapeutic potential. This study aimed to review and document medicinal plants traditionally used for diabetes treatment in the southern provinces of Iran. This review was conducted by systematically searching scholarly articles using keywords such as medicinal plants, ethnobotany, and the names of southern Iranian provinces, including Sistan and Baluchestan, Bushehr, Hormozgan, Khuzestan, Fars, and Kerman. Reputable scientific databases—Google Scholar, SID, Magiran, PubMed, and Scopus—were explored to identify relevant ethnobotanical studies. Selected articles were critically analyzed to extract and compile information on plant species and their traditional uses for diabetes. The review identified numerous plant species cited in ethnobotanical records of southern Iran for their anti-diabetic applications. Key species include *Cichorium intybus, Achillea millefolium, Medicago sativa, Stachys byzantina, Amygdalus lycioides, Descurainia sophia, Amygdalus scoparia, Withania somnifera, Otostegia persica, Urtica dioica, Tribulus terrestris, Pistacia atlantica, Dorema aucheri, Artemisia siberi, Allium cepa, Kelussia odoratissima, Brassica napus, Citrullus colocynthis, Teucrium polium, Solanum nigrum, Vicia faba, Trigonella foenum-graecum, Salvia macrosiphon, Morus alba, Sesamum indicum, Zataria multiflora, Olea ferruginea,* and *Hordeum vulgare*. Leaves, aerial parts, and fruits were the most frequently utilized plant parts. These species were predominantly distributed across Fars, Khuzestan, Kerman, Bushehr, and Sistan and Baluchestan provinces. This study highlights the richness of ethnobotanical knowledge in southern Iran, where medicinal plants from the Asteraceae, Lamiaceae, and Fabaceae families are widely used in traditional diabetes treatment. Their ecological distribution across several provinces emphasizes the interplay between regional biodiversity and traditional healing practices. Documenting these species offers promising pathways for future research and development of plant-based antidiabetic therapies.

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Introduction

Diabetes is one of the most significant non-communicable chronic diseases that has seen a dramatic increase in prevalence globally in recent years (Roglic, 2016; Jalili et al., 2024). This disease is associated with impaired regulation of blood sugar levels, directly affecting the functioning of various organs, including the heart, kidneys, nerves, and eyes (Zimmet et al., 2014; Gharabagh et al., 2024). The long-term complications of diabetes can lead to severe disabilities and even premature death (Winer, 2004). The pathophysiology of type 2 diabetes involves insulin resistance and a decrease in insulin secretion from the pancreas (Esmaeili et al., 2024; Banday et al., 2020). In this condition, cells become resistant to insulin, and glucose is not properly absorbed into the cells, leading to elevated blood sugar levels. This can result in long-term complications such as cardiovascular, renal, and visual problems (Banday et al., 2020).

Pharmaceutical treatments for diabetes may cause side effects such as hypoglycemia, gastrointestinal problems, weight gain, and liver and kidney disorders. Consequently, many patients seek herbal and natural treatments to mitigate these side effects (Kokil et al., 2020). Conventional diabetes treatments mainly involve the use of chemical medications and dietary adjustments, but due to the side effects and high costs, many patients turn to natural and herbal remedies (Kokil et al., 2020).

Ethnobotany, a branch of anthropology, studies the relationships between humans and plants in various cultural contexts, particularly focusing on the medicinal and therapeutic uses of plants in different societies (Bahmani et al., 2023). This field examines how knowledge related to plants is identified, used, and transmitted from past generations to present ones in indigenous and local communities (Negahdari, 2023). As the study of human-plant relationships in different cultures, ethnobotany can play an essential role in identifying medicinal plants that are effective in treating diseases (Dastyar and Ahmadi, 2022). Many traditional societies worldwide have used medicinal plants to control and treat diabetes (Dastyar and Ahmadi, 2022). In Iran, especially in the southern regions, there is a rich and widespread ethnobotanical knowledge among the people, with numerous medicinal plants being used to treat diabetes in these areas (Dastyar and Altememy, 2022).

Iran, with its diverse climate and biodiversity, boasts a rich plant heritage that plays a significant role in its traditional medicine and ethnobotany. Many native plants in Iran are known for their effectiveness in treating diabetes and are widely used in herbal treatments such as Cinnamon, Hyssop, Valerian, Dandelion, and Licorice. Therefore, reviewing and documenting the medicinal plants effective in treating diabetes in these regions will not only contribute to the development of herbal treatments but also provide a rich source for scientific research in the fields of medicine and healthcare.

Methodology

In this review study, articles were searched using keywords such as "medicinal plants," "ethnobotany," and the names of southern provinces of Iran (Sistan and Baluchestan, Bushehr, Hormozgan, Khuzestan, Fars, and Kerman) in reputable databases such as Google Scholar, SID, Magiran, PubMed, and Scopus. The selection criteria included the language of the article, which was either Persian or English. Ethnobotanical articles were then content-analyzed for their impact on the treatment of diabetes.

Results

Based on the results obtained from the literature review of ethnobotanical studies in the southern provinces of Iran, it was found that medicinal plants such as chicory, yarrow, alfalfa, lamb's ear, bitter almond, plantain, wild almond, cheeseplant, safflower, nettle, costmary, gum mastic, wild oregano, sage, onion, wild celery, turnip, bitter melon, fenugreek, jujube, white mulberry, sesame, Shirazi thyme, hogweed, wild rye, and barley are used ethnobotanically for the treatment of diabetes.

Table 1. Medicinal Plants Effective Against Diabetes in the Ethnobotanical Knowledge of the Southern Strip of Iran

Scientific Name	Common Name	Family	Traditional Use	Used Part	Ecological Status	Region	Reference
Cichorium intybus	Chicory	Asteraceae	Decoction	Leaf, Root	Perennial	Abadeh Shiraz	Kiasi et al., 2019
Achillea millefolium	Yarrow	Asteraceae	Decoction	Flower, Leaf	Perennial	Abadeh Shiraz	Kiasi et al., 2019
Medicago sativa	Alfalfa	Fabaceae	Herbal tea	Leaf	Perennial	Abadeh Shiraz	Kiasi et al., 2019
Stachys byzantina	Lamb's Ears	Lamiaceae	Herbal tea	Leaf, Flowering Shoot	Perennial	Abadeh Shiraz	Kiasi et al., 2019
Amygdalus lycioides Spach	Blackthorn Almond	Rosaceae	Decoction	Fruit	Perennial	Abadeh Shiraz	Kiasi et al., 2019
Descurainia sophia	Hedge Mustard	Brassicaceae	Decoction	Fruit	Annual	Iranshahr	Arbabi et al., 2023
Amygdalus scoparia	Wild Almond	Rosaceae	Decoction	Fruit	Perennial	Balochistan	Keshtegar et al., 2015
Withania somnifera	Ashwagandha	Solanaceae	Herbal tea	Leaf, Fruit	Perennial	Balochistan	Keshtegar et al., 2015
Otostegia persica	Persian Otostegia	Lamiaceae	Decoction	Leaf, Fruit	Perennial	Balochistan	Keshtegar et al., 2015
Cichorium intybus L.	Chicory	Asteraceae	Decoction	Leaf	Perennial	Behbahan	Razmjoue et al., 2017
Urtica dioica L.	Nettle	Urticaceae	Herbal tea	Aerial Parts	Perennial	Behbahan	Razmjoue et al., 2017
Tribulus terrestris L.	Punctureveine	Zygophyllaceae	Herbal tea	Aerial Parts	Annual	Behbahan	Razmjoue et al., 2017
Pistacia atlantica Desf.	Pistachio	Anacardiaceae	Decoction	Resin	Perennial	Pasargad Fars	Hosseini et al., 2023
Dorema aucheri Boiss.	Mountain Dorema	Apiaceae	Decoction	Leaf, Stem	Perennial	Pasargad Fars	Hosseini et al., 2023
Artemisia siberi Besser.	Siberian Wormwood	Asteraceae	Decoction	Aerial Parts	Perennial	Pasargad Fars	Hosseini et al., 2023
Allium cepa	Onion	Amaryllidaceae	Decoction	Bulb	Biennial	Dashtestan Bushehr	Dowlatkhahi et al., 2013
Kelussia odoratissima	Wild Celery	Apiaceae	Decoction	Leaf, Stem	Perennial	East Khuzestan	Khodaiari et al., 2014
Brassica napus L.	Rapeseed	Brassicaceae	Herbal tea	Seed, Root	Annual	East Khuzestan	Khodaiari et al., 2014

Table 1. continued

Citrullus colocynthis	Colocynth	Cucurbitaceae	Herbal tea	Fruit	Perennial	East Khuzestan	Khodaiari et al., 2014
Teucrium polium L.	Polemonium	Lamiaceae	Decoction	Aerial Parts	Perennial	East Khuzestan	Khodaiari et al., 2014
Solanum nigrum L.	Black Nightshade	Solanaceae	Decoction	Aerial Parts, Fruit	Annual	East Khuzestan	Khodaiari et al., 2014
Citrullus colocynthis (L.)	Colocynth	Cucurbitaceae	Decoction	Fruit	Perennial	Fasa	Ramezanian and Minaei-Far, 2016
Vicia faba Moench	Broad Bean	Fabaceae	Decoction	Leaf	Annual	Fasa	Ramezanian and Minaei-Far, 2016
Trigonella foenum-graecum L.	Fenugreek	Fabaceae	Decoction	Leaf	Annual	Fasa	Ramezanian and Minaei-Far, 2016
Salvia macrosiphon Boiss.	Macrosiphon Sage	Lamiaceae	Decoction	Leaf	Perennial	Fasa	Ramezanian and Minaei-Far, 2016
Morus alba L.	White Mulberry	Moraceae	Decoction	Fruit	Perennial	Fasa	Ramezanian and Minaei-Far, 2016
Sesamum indicum L.	Sesame	Pedaliaceae	Decoction	Fruit	Annual	Fasa	Ramezanian and Minaei-Far, 2016
Descurainia sophia	Hedge Mustard	Brassicaceae	Herbal tea	Fruit	Annual	Kangan Assaluyeh	Alebrahim and Nabipour, 2018
Aveshim Shirazi	Shirazi Aveshim	Lamiaceae	Decoction	Aerial Parts	Perennial	Kohmand	Lauri et al., 2017
Teucrium polium	Polemonium	Lamiaceae	Decoction	Aerial Parts	Perennial	Gonaveh	Moradi et al., 2014
Olea ferruginea	Olea	Oleaceae	Herbal tea	Aerial Parts	Perennial	Gnoo Bandar Abbas	Soltani Poor et al., 2005
Citrullus colocynthis	Colocynth	Cucurbitaceae	Decoction	Fruit	Perennial	Sirjan Kerman	Sharifi Far et al., 2010
Hordeum vulgare	Barley	Poaceae	Decoction	Seed	Annual	Sirjan Kerman	Sharifi Far et al., 2010

Based on the findings, the highest species diversity was observed in the families Lamiaceae and Asteraceae, likely due to their extensive applications in traditional medicine and their high ecological adaptability across various regions of Iran. The predominance of perennial plants suggests that these species possess greater ecological stability and are better adapted to the environmental conditions of Iran. The prevalence of decoctions as the primary method of consumption indicates that many of these plants contain bioactive compounds requiring prolonged exposure to heat for effective extraction. Leaves were identified as the most frequently utilized plant part, as they are typically rich in phenolic compounds, flavonoids, and alkaloids, which play a crucial role in traditional medicinal practices. Notably, Fars Province exhibited the highest plant diversity, which could be attributed to its favorable climatic conditions and more comprehensive botanical documentation.

Discussion

Diabetes is a common metabolic disorder, and its management through the use of medicinal plants in traditional Iranian medicine has been emphasized for centuries. Various ethnobotanical studies have shown that medicinal plants play a vital role in the treatment of diabetes. These plants are used in different regions of the country to reduce diabetes symptoms and control blood sugar levels. According to a study on ethnobotany in Iran, 282 plant species from 63 families have been identified for diabetes treatment. Plants such as Urtica dioica, Citrullus colocynthis, Teucrium polium, Juglans regia, and Trigonella foenum-graecum are among the most important species used for diabetes treatment. Phylogenetic studies reveal a significant correlation between plant families and the plant organs used in the treatment of diabetes through evolutionary patterns (Labbafi et al., 2024).

Studies conducted in northwestern Iran have shown that plants such as Apium graveolens, Alyssum desertorum, Arctium lappa, Avena sativa, Berberis integerima, Cerasus microcarpa, Crataegus aronia, Allium schoenoprasum, Urtica dioica, Phlomis aucheri, Salvia aethiopis, and Melilotus officinalis have been traditionally used for treating diabetes in this region. These plants are especially known in the local folk medicine for their anti-diabetic properties. A study in Urmia also found that 30 medicinal plants from 17 families are used for diabetes treatment, with the Lamiaceae family being the most represented, comprising 20% of the plants. The most common preparation methods for these plants are decoctions, with Citrullus colocynthis being the most widely used plant among traditional healers (Bahmani et al., 2014).

Findings from Eastern Khuzestan also suggest the positive effects of plants like Trigonella foenum-graecum, Citrullus colocynthis, and Urtica dioica in managing diabetes. These plants exert their therapeutic effects through various parts such as leaves, roots, and seeds. In this region, decoctions (60%) and infusions (40%) are the main methods of consumption. However, further studies are required to identify the effective phytochemical compounds in these plants (Negahdari, 2023).

A review study on diabetes prevention and treatment based on ethnobotanical knowledge from various regions of Iran showed that plants like Urtica dioica, Teucrium polium, and Trigonella foenum-graecum have been frequently used in multiple regions for treating and preventing diabetes. These plants hold potential for further investigation to be introduced as new medicinal sources with fewer side effects in future studies (Asadi-Samani et al., 2017).

In Shiraz, the use of plants like Juglans regia, Cinnamomum verum, Ficus johannis, Trigonella monpeliaca, Arctium lappa, and Urtica dioica is common for treating diabetes. These plants are widely used in traditional medicine for controlling blood sugar levels (Baharvand-Ahmadi et al., 2015). Medicinal plants can assist in controlling and reducing blood sugar levels through various mechanisms, such as improving insulin sensitivity, reducing oxidative stress, decreasing inflammation, and enhancing glucose metabolism. These plants can serve as an effective complement to existing pharmaceutical treatments, playing a crucial role in the management of diabetes (Patel et al., 2012; Malviya et al., 2010).

Conclusion

The use of medicinal plants for treating diabetes in Iran is not only prevalent in traditional practices but is also well-supported by scientific evidence. To further exploit the therapeutic properties of these plants, it is essential to conduct more phytochemical and clinical studies to precisely identify their active compounds and medicinal applications. Additionally, using these plants in the

development of new drugs with fewer side effects could serve as an effective strategy for managing diabetes.

Declarations

Conflict of Interest

The author declares no conflict of interest related to the publication of this article.

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Consent for Publication

The author confirms that the final version of the manuscript has been reviewed and approved for publication.

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Author's Contributions

Laya Hooshmand Garehbagh was responsible for conceptualization, data collection, analysis, and manuscript preparation.

Ethical Considerations

As this study is a review article, it does not involve human or animal subjects and therefore does not require ethical approval or informed consent.

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