JBP
Journal of Biochemicals and Phytomedicine
eISSN: 2958-8561

Ethnobotanical Study of Medicinal Plants Used for Management of Diabetes Mellitus in the East of Khuzestan, Southwest Iran

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ARTICLE INFO

Article Type:
Research

Article History:
Recived: 10 Aug 2022
Revised: 17 Nov 2022
Accepted: 25 Jan 2023
Available online: 1 March 2023

Keywords:
Asteraceae
Ethnobotany
Medicinal plants
Diabetes Mellitus
Khuzestan

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ABSTRACT

Introduction: Diabetes mellitus is recognized as a life-threatening disease with numerous dangerous complications. Several medicinal plants have been identified for the treatment of diabetes mellitus. Hence, the aim of this article was to conduct an ethnobotanical study about medicinal plants used for the management of diabetes mellitus in the East of Khuzestan, South Iran.

Methods: This study was performed in the East of Khuzestan, Southwest Iran. Ethnobotanical information was collected through interviews and questionnaires among 20 traditional healers. Demographic information was also received from traditional healers. Ultimately, the data were analyzed in Excel.

Results: Our findings showed the most effective medicinal plants, such as *Trigonella foenum- graecum* L., *Citrullus colocynthis*, *Urtiandrum dioica* L., *Solanum nigrum* L., *Arctium lappa* L., *Ranunculus arvensis* L., and *Amygdalus scoparia* Spach in managing diabetes. We also observed that leaves, aerial parts, root and seeds of these plants play important roles in the management of diabetes. Furthermore, 60% of preparation methods of medicinal plants were based on decoction form. Infusion (40%) was observed as another type of preparation method.

Conclusion: The identified medicinal plants displayed valuable effects against diabetes mellitus. Hence, more studies about the therapeutic role of phytochemical constituents presented in these medicinal plants could determine their therapeutic ability.

Please cite this paper as:
Negahdari S. Ethnobotanical study of medicinal plants used for management of diabetes mellitus in the east of Khuzestan, southwest Iran. Journal of Biochemicals and Phytomedicine. 2023; 2(1): 7-10. doi: 10.34172/jbp.2023.3.

Intorduction

Diabetes mellitus is a metabolic disorder. In this disease, the ability to produce insulin in the body is lost or the body becomes resistant to insulin and therefore produced insulin cannot perform its normal function. The main role of insulin is to lower blood sugar by various mechanisms. Dysfunction of insulin causes chronic increase in blood sugar along with disorder in carbohydrate, fat and protein metabolism (Paul et al., 2020). Following the progress of

the disease, tissue and vascular damage leads to a variety of side effects, including vision, kidney, heart and blood vessel, nerve and wound types (Carrizzo et al., 2018). It can be said that diabetes causes a wide range of disorders; therefore, finding effective methods without side effects to treat this disease is one of the important goals of active researchers in this field. Type 2 diabetes is the most common type of diabetes and is usually associated with impaired insulin secretion and insulin resistance (Galicia-Garcia et al., 2020). The prevalence of type 2 diabetes all over the world ranges from 1% in the population of developing countries such as China to 50% in the United States of America. Also, this disorder is more common in urban populations than in rural ones (Gallardo-Rincón et al., 2021). Researchers showed that oldest way to treat diabetes mellitus is the use of plants. Based on this, it seems that many plants known all over the world play a significant role in treatment of diabetes. New researches show that renewed attention to old medicines and natural treatments has stimulated a new wave of research in the field of traditional methods of treating diabetes (Franco et al., 2018). Furthermore, the World Health Organization (WHO) emphasizes on the traditional methods of treating diabetes. Traditional anti-diabetic plants can be a useful source of blood sugar-lowering food compounds that can be used as medicine or food supplements (Skalli et al., 2019). Indeed, medicinal plants contain various types of phytochemical constituents that could overcome underlying mechanisms of development of diabetes mellitus such as oxidative stress, inflammation and damage to pancreatic cells (Tran et al., 2020). Hence, the aim of this article was to conduct an ethnobotanical study about medicinal plants used for management of diabetes mellitus in East of Khuzestan, South Iran.

Materials and Methods

Region of Study

The present ethnobotanical study was performed in East of Khuzestan, Southwestern Iran. Khuzestan province is a province located on the Persian Gulf coast in southwestern Iran. Khuzestan province covers 31.3273°N to 48.6940°E geographical coordinates.

Data Collection

This ethnobotanical investigation was conducted from March 2021 to February 2022. This study was carried out through face-to-face visits and through interviews and questionnaires among 20 traditional healers. The questionnaire was distributed among traditional healers. The questionnaires contained demographic information. The questioners personally visited the studied subjects and registered the beliefs of herbal medicine in relation to receiving medicinal and ethnobotanical information. The results obtained from the questionnaires were directly transferred to relevant tables and recorded. Finally, the data were analyzed by Excel (Baharvand-Ahmadi et al., 2016).

Results

Our findings highlighted that ten medicinal herbs from nine families were administered for management of diabetes. It has also been shown that the medicinal herbs in Asteraceae, Cucurbitaceae, Lamiaceae, Papilionacea, Polygonaceae, Ranunculaceae, Rosaceae, Urticaeae, and Solanaceae families were effective in management of diabetes. Furthermore, it has been understood that root (17%), leaves (17%), aerial parts (17%), fruit (16%), seed (17%), flower (8%) and gum (8%) were the most usable part of medicinal plants for the treatment of diabetes. In addition, it was observed that decoction (60%) and infusion (40%) were most important types of preparation methods of the medicinal plants, respectively (Table 1).

Based on the results obtained from the data analysis, it was found that 10 medicinal plants from 9 plant families have the effect of traditional treatment in diabetes in this region (Table 2).

Figure 1 shows the percentage of plant parts traditionally used as anti-diabetes in the Khuzestan region. Also, the percentage of the traditional use of medicinal plants in the Khuzestan region as anti-diabetes has been shown in figure 2.

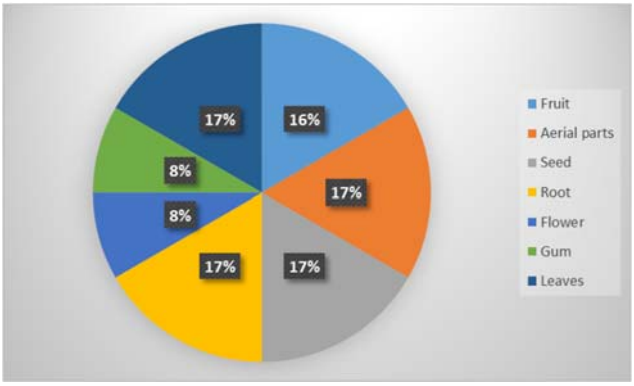

Figure 1. The percentage of plant organs used traditionally as anti-diabetes in Khuzestan region

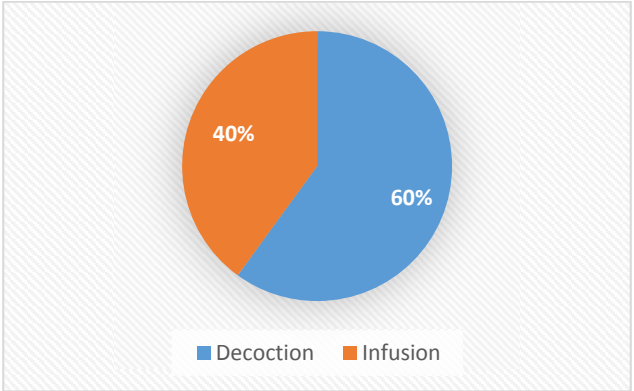

Figure 2. The percentage of traditional use of medicinal plants in Khuzestan region as anti-diabetes

Table 1. Medicinal plants used in East of Khuzestan, Southwest Iran for the management of diabetes

Scientific name	Family	Persian name	Usable part of plant	Preparation methods
Arctium lappa L.	Asteraceae	Baba adam	Root and leaves	Decoction
Citrullus colocynthis	Cucurbitaceae	Hendevane aboojahl	Fruit	Infusion
Teucrium polium L.	Lamiaceae	Maryam nokhodi	Aerial parts	Decoction
Securigera securidaca Degen & Dorfl	Papilionacea	Adase talkh	Seed	Decoction
Trigonella foenum- graecum L.	Papilionacea	Shanbalileh	Seed	Decoction
Rumex pulcher L.	Polygonaceae	Torshak	Root	Decoction
Ranunculus arvensis L.	Ranunculaceae	Gole zard	Flower	Infusion
Amygdalus scoparia Spach	Rosaceae	Arzhan	Gum	Infusion
Urtiandrum dioica L.	Urticaeae	Gazaneh	Leaves	Infusion
Solanum nigrum L.	Solanaceae	Tajrizi	Fruit and aerial parts	Decoction

Table 2. Distribution of plant families with traditional antidiabetic effects in Khuzestan region

Herbal family	Number
Asteraceae	1
Cucurbitaceae	1
Lamiaceae	1
Papilionacea	2
Polygonaceae	1
Ranunculaceae	1
Rosaceae	1
Solanaceae	1

Discussion

Several medicinal plants are used to treat diabetes mellitus all over the world. Various medicinal herbs are used in Iranian traditional medicine to treat diabetes mellitus. Iran is known for having many types of medicinal plants (Abu-Odeh et al., 2021). Ethnobotanical investigations are helpful solutions to identify the types of plants widely used in traditional medicine. Identifying potential plant resources to cure a wide range of diseases is one of the applications of this type of studies (Baharvand-Ahmadi et al., 2016). The main objective of present study was to obtain ethno-medicinal data from herbal traditional healer in East of Khuzestan, South Iran for the use of medicinal herbs as a treatment for diabetes mellitus. Findings of the present study displayed that a total of ten medicinal herbs including *Arctium lappa* L., *Citrullus colocynthis*, *Eucrium polium* L., *Securigera securidaca* Degen & Dorfl, *Trigonella foenum- graecum* L., *Rumex pulcher* L., *Ranunculus arvensis* L., *Amygdalus scoparia* Spach, *Urtiandrum dioica* L., and *Solanum nigrum* L. from nine families were administered for management of diabetes. There were several medicinal herbs in various families with protective effects against diabetes. It should be noted that leaves, aerial parts, root and seeds each made up 17% of the parts used in plants for the management of diabetes. Furthermore, fruit, flower and gum were used in 16, 8 and 8% of plants to control diabetes, respectively. Decoction and infusion were the most common forms of preparation methods of medicinal plants for diabetes management in East of Khuzestan, Southwest Iran with 60 and 40%, respectively. Diabetes is the most common metabolic disease, which requires special attention in control and treatment due to its complications and consequences, including cardiovascular diseases, kidney diseases, stroke and damage to the nervous system (Samocha-Bonet et al., 2021). Although various methods such as lifestyle changes, exercise and in most cases the use of chemical drugs are the only effective treatment. Many people use alternatives or supplements including medicinal plants to avoid the side effects of conventional drugs (Alam et al., 2021). Researchers have shown various mechanisms involved in development of diabetes. Oxidative stress is one of the most important mechanisms involved in diabetes. Free radicals play an important role in both health and disease (Halim et al., 2019). Medicinal plants are known as rich sources of phytochemical compounds with antioxidant properties.

Phenolic, flavonoid and alkaloid compounds are the main plant phytochemical compounds with antioxidant properties (Teoh et al., 2018). For instance, there are several pieces of evidence about various biological properties of *Arctium lappa* L. as important medicinal plants comprising antioxidant and anti-diabetic effects. Indeed, it has been reported that phytochemical constituents including phenolic compounds and terpenes are main antioxidant compounds which are responsible for development of its anti-diabetic effects (Mondal et al., 2022). Another important medicinal plant with anti-diabetic property in traditional medicine is *Citrullus colocynthis*. It is a well-known medicinal plant with anti-diabetic effect. It has been found that the presence of various active ingredients in this plant may attributed to this anti-diabetic effect (Ostovar et al., 2020). There are several types of the medicinal plants which are used to manage diabetes mellitus in various parts of Iran. In a study conducted by Bahmani and his team, the findings revealed use of thirty medicinal herbs from 17 families for controlling diabetes mellitus in the Urmia, Northwest Iran. For example, in this study, authors found *Citrullus colocynthis* as the most important herb with anti-diabetic effect. In other regions of Iran such as Arasbaran (northwest of Iran), Isfahan (Central Iran), Shiraz (South of Iran) and Ilam provinces (West of Iran), several medicinal plants including *Equisetum arvense* L., *Rubus caesius* L., *Glaucium oxylobum* Boiss, *Juglans regia* L., *C. colocynthis* L., and *Glycyrrhiza glabra* L. were administered for the treatment of diabetes mellitus (Bahmani et al., 2014).

Conclusions

Our observations during this study showed the effective role of medicinal plants in management of diabetes. The plants examined in this study have a special place in Iranian traditional medicine and have amazing uses in different forms such as decoctions to control diabetes. Taking together, medicinal plants are known as important sources of therapeutics in traditional medicine. A wide range of them are used in the treatment of diabetes. Their low side effects can help to compete with chemical drugs for the treatment of diseases. Further studies of the compounds from these plants and their mechanisms of action are needed.

Conflict of interest

There is no conflict of interest

Acknowledgement

The author is grateful to the Legal Medicine Research Center, Legal Medicine Organization, Ahvaz, Iran.

Consent for publications

The author approved the manuscript for publication.

Funding/support

None.

Authors' contributions

SN conceived the research idea and designed the work. SN carried out the experiment and the statistical analysis. SN wrote the first draft of the manuscript. SN approved the final revision.

Ethical considerations

Ethical issues (including plagiarism, misconduct, data fabrication, falsification, double publication or submission, redundancy) have been completely observed by the author.

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