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## Some Plants used as Diabetic in Turkey Traditional Medicine

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### Abstract

Diabetes is one of the most common diseases globally, it leads to hyperglycemia and prolonged hyperglycemia can cause severe mortalities every system of the human body; change in the metabolism of lipids, carbohydrates, proteins, and in the long term, with eye, kidney, cardiovascular, and neurological complications. In spite of the developments in medicinal chemistry, traditional medicine is still a common practice for the treatment of diabetes. The number of studies on plants used by the public in diabetes is few. Conventionally there are some medicines to treat diabetes mellitus but desired effective treatment is still not to be achieved. Thus, it is essential to look for more effective antidiabetic agents with fewer side effects like natural medicinal and aromatic plants. However some medicinal and aromatic plant derived products have proven to be effective and safe in the treatment of various types of diabetes mellitus. So researches are going on for the development of alternative effective therapy against this common disease. In Turkey ethnobotany, some medicinal and aromatic plants have been used as blood sugar lowering agents. Turkish flora with more than 13.000 plant taxa and medicinal plants are widely used traditionally for the prevention and cure of diabetes and many of them are used for different purposes.

This article consists of 147 plant taxa which are reported to have good antidiabetic property and 39 plant taxa from Çelikhan (Adıyaman-Turkey) provinces which have potential antidiabetic property. In addition this study focuses on diabetes mellitus and the role of plants in the treatment of diabetes mellitus in Turkey, in order to provide additional information for healthcare professionals.

**Keywords:** antidiabetic plants, traditional medicine, diabetes mellitus, medicinal plants.

### 1. Introduction

Diabetes mellitus is a common illness affecting most of the people; it is estimated that 25 % of the world population is affected by this disease (WHO, 2016). Diabetes mellitus is a metabolic irregularity characterized by a loss of glucose homeostasis, due to disturbances of carbohydrate, protein and fat metabolism, resulting from defects in insulin production and secretion (Barcelo, Rajpathak, 2001). This disease can result in long-term damage to the kidneys, eyes, liver, nerves, heart and blood vessels of humans and can lead to death (Pari, Saravanan, 2004). Diabetes mellitus is associated with reduced quality of life and increased risk factors for mortality and morbidity (Upendra et al., 2020). Medicinal and aromatic plants, have been used in virtually all cultures and in ethnobotany as a source of drug. It has been estimated that more than 80 % of population, rely on traditional medicine for their primary health care needs and it is assumed that

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a major part of traditional therapy involves the use of medicinal plant extracts or their active substances (Ignacimuthu et al., 2006).

Medicinal and aromatic plants today as in the past extensively used for various diseases and these economically important plants are considered as a therapeutic aid for reducing illness of human being. Natural compounds, natural drugs and natural medicinal plants may be good and feasible alternatives for the treatment of diabetes and these substances may even reduce the risk of the disease. There are a large plenty of plants and natural products that have been discussed in literature for their antidiabetic effects (Soumyanath, 2006). The search for natural products to cure illness has received considerable attentions in which medicinal and aromatic plants have been the most important source (Okwu, 2001). They are believed to be an important source of new chemical substances with potential therapeutic effects, and due to the crucial role that plant-derived compounds have played in drug discovery, and development for the treatment of several illness (Rang, Dale, 1991). Medicinal and aromatic plant taxa have become targets in searching for drugs and in the management and treatment of chronic diseases. Traditional therapies are available for diabetes mellitus; but in developing countries the anti-diabetic medicines are not affordable by many people as they are expensive, so alternatively traditional medicinal plants by several research groups to overcome the diabetes. Although, oral hypoglycemic agents are the mainstay of cure of diabetes, they have prominent side effects and fail to significantly alter the course of diabetic complications and there is need to look for more efficacious agents with lesser side effects (Rang, Dale, 1991). Traditional medicine products are playing significant roles in the lives of the people across the world in the face of the global upsurge of drug resistance, toxicity, adverse effects and increasing costs of synthetic products (Mbi, Bilikha, 1998). Herbal medicine is used for remedy of diabetes in developing countries where the cost of conventional medicines is a burden to the population (Saravanan, Pari, 2008). Some medicinal and aromatic plants of Turkey and Çelikhan (Adıyaman-Turkey) provinces have been found to be useful to successfully manage diabetes. In Turkey more than 2500 plant taxa are estimated to have potential for phytotherapeutic use and approximately half of them to be used as folk remedies in ethnobotany (Yeşilada, 2009). In Turkey, some plants have been claimed to possess medicinal properties, employed in the treatment of many diseases is quite common. One of the big advantages of these plants is that these are readily available and have low side effects. The ethnobotanical information and traditional medicine reports more than 800 plant taxa may possess antidiabetic potential in the world (Alarcon-Aguilara et al., 1998). Presently, medicinal plants continue to play an important role in the management of diabetes mellitus, especially in developing countries where many people do not have access to modern antidiabetic drugs (Acharya, Shrivastava, 2008). However, the some knowledge of medicinal uses of plants and ethnobotanical properties are lost or to be forgotten. Therefore, there is need to collect and document this knowledge before such rich heritages are lost.

Our main purpose in this study is to prevent the disappearance of the information about the plants used in the treatment of diabetes or to transfer this information to the future generations, to present it to the interest and knowledge of the people living in different regions and the local people, then to serve as a source for those who want to work on the subject or those who work on this subject to direct the pharmacological studies to be carried out on the plants we have collected and reported. In addition, the present review work was aimed to collect and document medicinal plants used for the treatment diabetes mellitus in traditional medicine of Turkey, by thorough literature survey and field study from Çelikhan (Adıyaman-Turkey) provinces. This research also may be useful for scholars who are doing research in phyto-pharmacology and helping to build up their knowledge on developing alternative medicine for various kind of diabetes mellitus and associated ailments and to present a scientifically relevant review for both researchers and readers, who are interested in the biologically active plants traditionally used in the treatment of diabetes.

## 2. Materials and methods

This research was carried out by thorough searching of different ethnobotany research articles of Turkey. As a result of this study, 147 taxa were determined from the literature survey and showed in Table 1. Table 1 was arranged by specifying the family of the plant, the local name, the part of the plant used and the way of use, based on the region where the plants are used. As a result of field studies from Çelikhan (Adıyaman-Turkey) provinces in the 2019–2020 years 39 plant taxa were collected from their habitat have potential to be used in the treatment of diabetes.

**Table 1.** Medicinal plants having antidiabetic activity

Family	Botanical name	Local name	Used part	Usage
Rosaceae	<i>Rubus hirtus</i>	Yaban üzümü	Roots	Decoction (Sezik et al., 1997)
Caprifoliaceae	<i>Sambucus nigra</i>	Mürver	Flowers	Infusion (Sezik et al., 1997)
Rosaceae	<i>Sorbus domestica</i>	Üvez	Leaves	Decoction (Sezik et al., 1997)
Cupressaceae	<i>Juniperus foetidissima</i>	Kara ardıç	Cones	Decoction (Tuzlacı, Erol, 1999)
Cupressaceae	<i>Juniperus oxycedrus</i>	Diken ardıç	Leaves and cones	Decoction (Tuzlacı, Erol, 1999)
Moraceae	<i>Morus rubra</i>	Kara dut	Fruit juice	Drink before meals (Tuzlacı, Erol, 1999)
Fagaceae	<i>Quercus coccifera</i>	Pırnal çalısı	Roots and brackets	Decoction (Tuzlacı, Erol, 1999)
Lamiaceae	<i>Teucrium polium</i>	Oğlan otu	Leaves	Decoction (Tuzlacı, Erol, 1999)
Rosaceae	<i>Rosa canina</i>	Kuşburnu	Fruits	Decoction (Yeşilada et al., 1999)
Liliaceae	<i>Allium sativum</i>	Sarımsak	Onions	It is eaten raw (Tuzlacı, Tolon, 2000)
Oleaceae	<i>Olea europea</i> var. <i>europea</i>	Zeytin	Leaves	Decoction (Tuzlacı, Tolon, 2000)
Rosaceae	<i>Prunus spinosa</i> subsp. <i>dasyphylla</i>	Göğem eriği	Fruits	Decoction (Tuzlacı, Tolon, 2000)
Urticaceae	<i>Urtica dioica</i>	Isırgan otu	Above ground part	Decoction (Tuzlacı, Tolon, 2000)
Rosaceae	<i>Cydonia oblonga</i>	Ayva	Leaves	Decoction (Tuzlacı, Tolon, 2000)
Pinaceae	<i>Pinus brutia</i>	Kızılçam	Cone, pine leaf	Pine leaf boiled and drinking 1 glass on an empty stomach in the morning (Miyaru, 2001)
Rosaceae	<i>Pyrus amygdaliform</i> var. <i>amygdaliform</i>	Çöğür/Ahlat /Aklat	Fruit, twig	Fruit of sugar disease is good, boiled and drunk (Ertuğ, 2000)
Rubiaceae	<i>Galium aparine</i>	Sarı Yoğurt Otu /Yapışkan otu	Leaves and twig	The stems of the sticky herb are beaten when they are wet, and the okra seeds are pounded, mixed, boiled, and are good for diabetes when placed in a bottle (Ertuğ, 2000)
Malvaceae	<i>Malva neglecta</i>	Ebegümeçi,	Leaves	It is boiled and eaten (Avcı, Ezer, 2000)
Moraceae	<i>Morus nigra</i>	Kara dut	Leaves	Infusion (Avcı, Ezer, 2000)
Areceae	<i>Arum dentrucatum</i>	Karibel	Leaves	Decoction (Özgökçe, Özçelik, 2004)
Polygonaceae	<i>Rheum ribes</i>	İşkin	Roots	Decoction (Özgökçe, Özçelik, 2004)
Ranunculaceae	<i>Nigella segetalis</i>	Çörek otu	Seeds	Decoction (Özgökçe, Özçelik, 2004)
Lamiaceae	<i>Origanum majorana</i>	Kekik otu	Leaves and flowers	Infusion (Uzun, 2005)
Rosaceae	<i>Rubus sanctus</i>	Böğürtlen	Fruits and leaves	Decoction (Köse et al., 2005)
Cornaceae	<i>Cornus mas</i>	Kızılık	Berries or fruit juices	Syrup is made from the fruit against diabetes (Özçelik, Balabanlı, 2005)

Fagaceae	<i>Quercus ithaburensis</i> subsp. <i>macrolepis</i>	Palamut	Seeds	Against diabetes, fruit and leaves tea are used (Özçelik, Balabanlı, 2005)
Lamiaceae	<i>Thymbra spicata</i>	Zahter, Kirkekiği, Taş kekigi, kekigi Dağ	Leaves, flowers and fresh shoots	Tea obtained from the leaves is used for diabetes (Özçelik, Balabanlı, 2005)
Lamiaceae	<i>Thymus cilicicus</i>	Kekik	Leaves, flowers and fresh shoots	Tea obtained from the leaves is used for diabetes (Özçelik, Balabanlı, 2005)
Myrtaceae	<i>Myrtus communis</i>	Mersin	Leaves, fruits and fresh branches	Infusion (Özçelik, Balabanlı, 2005)
Polygonaceae	<i>Polygonum cognatum</i>	Madımak, Kuş ekmeği	Fresh leaf	It is consumed in the form of a salad or by cooking (Özçelik, Balabanlı, 2005)
Zygophyllaceae	<i>Tribulus terrestris</i>	Demir Pıtırak	Above ground parts	Water obtained from boiling used (Özçelik, Balabanlı, 2005)
Liliaceae	<i>Allium porrum</i>	Pırasa	Fresh leaves	It is cooked and cooked (Pieronia et al., 2005)
Rutaceae	<i>Citrus paradisi</i>	Greyfruit	Mesocarpal part of the fruits is used	Decoction is prepared from mesocarps (Pieronia et al., 2005)
Anacardiaceae	<i>Pistacia terebinthus</i>	Çitlembik/Mene ngiç	Dried fruits	It is eaten by drying (Pieronia et al., 2005)
Rosaceae	<i>Prunus spinosa</i>	Erik ekşisi	Dried fruits	Decoction (Pieronia et al., 2005)
Punicaceae	<i>Punica granatum</i>	Nar	Fruits	It is consumed fresh (Pieronia et al., 2005)
Polygonaceae	<i>Rumex acetosella</i>	Kuzu kulagi	Fresh leaves	Packed (Pieronia et al., 2005)
Asteraceae	<i>Taraxacum officinale</i>	Karahindiba	Fresh leaves	Packed (Pieronia et al., 2005)
Urticaceae	<i>Urtica dioica</i>	Isırgan otu	Dried leaves	Decoction (Pieronia et al., 2005)
Zingiberaceae	<i>Zingiber officinalis</i>	Zencefil	Rhizoms	Decoction (Pieronia et al., 2005)
Gramineae	<i>Avena barbata</i>	Yabani yulaf, yabani burçak	Leaves, shoots and flowers	Decoction (Doğanoğlu et al., 2009)
Asteraceae	<i>Artemisia absinthium</i>	Pelin otu	Above ground parts	Boiled and drunk on an empty stomach, it is good for diabetes (Bağcı et al., 2006)
Anacardiaceae	<i>Cotinus coggyria</i>	Tetra	Leaves	Decoction (Ecevit, Özhatay, 2006)
Juglandaceae	<i>Juglans regia</i>	Ceviz	Fruit pericarps	Decoction (Ecevit, Özhatay, 2006)
Lauraceae	<i>Laurus nobilis</i>	Defne	Leaves	Decoction (Ecevit, Özhatay, 2006)
Platanaceae	<i>Platanus orientalis</i>	Çınar	Leaves	Decoction (Ecevit, Özhatay, 2006)
Salicaceae	<i>Populus tremula</i>	Kavak	Leaf and peeled shells	Leaves infusion, shells decoction (Ecevit, Özhatay, 2006)
Rosaceae	<i>Pyrus bulgarica</i>	Ahlat	Fruits	It is pickled (Ecevit, Özhatay, 2006)
Rosaceae	<i>Prunus spinosa</i> subsp. <i>dasyphylla</i>	Güvem	Fruits	It is eaten raw (Ecevit, Özhatay, 2006)

Rosaceae	Rubus discolor	Çoban kösteği, böğürtlen	Roots	Decoction (Ecevit, Özhatay, 2006)
Lamiaceae	Thymus zygoides var. zygoides	Kekik	Fresh shoots	Infusion (Ecevit, Özhatay, 2006)
Lamiaceae	Thymus praecox subsp. scorpii	Kekik, Kekik otu, Kekük	Flowers, leaves, fresh shoots	Decoction (Ezer, Arısan, 2006)
Loranthaceae	Viscum album subsp. album	Kökçe, Gökçe, Ökse otu	Leaves and branches	Decoction (Ezer, Arısan, 2006)
Asteraceae	Cnicus benedictus var. benedictus	Mübarek diken	Above ground parts	Decoction (Kilic, 2012)
Asteraceae	Scorzonera semicana	Yemlik, gilekoçuk	Leaves and roots	Decoction (Kilic, 2012)
Lamiaceae	Teucrium chamaedrys subsp. sinuatum	Kısamahmut, Dalak otu	Leaves and seeds	Infusion (Kilic, 2012)
Araliaceae	Hedera helix	Sarmaşık	Leaves and branches	Decoction (Çakılcıoğlu et al., 2007)
Compositae	Carduus nutans subsp. leiophyllus	Deve diken, eşek diken, çakır diken, eşek gengeri	Air particles	Decoction (Çakılcıoğlu et al., 2007)
Guttiferae	Hypericum perforatum	Kantaron, kantaron çayı, sarı kantaron, kantaryon, sarıcaşu, kantul, kesik otu	Flowers and leaves	Olive oil is used by waiting in olive oil (Çakılcıoğlu et al., 2007)
Geraniaceae	Geranium pratense subsp. finitimum	Turna gagası	Leaves	Decoction (Yeşilada, 2008)
Fabaceae	Vicia ervilia	Burçak, Birçak	Seeds	It is used in powder form (Uğurlu, Seçmen, 2008)
Rhamnaceae	Zizyphus jujuba	Günnap, Hünnap	Fruits	a decoction (Uğurlu, Seçmen, 2008)
Berberidaceae	Berberis crataegina	Karamuk	Fruits	Fruits are consumed raw (Savran et al., 2008)
Asteraceae	Helianthus tuberosus	Yer elması	Under ground part	It is consumed as a vegetable (Savran et al., 2008)
Asteraceae	Carduus pycnocephalus	Su diken, Soymaç	Body	The body part is peeled and eaten (Sarper et al., 2009)
Asteraceae	Onopordum acanthium	Kangal	Body	Its body is eaten raw (Sarper et al., 2009)
Brassicaceae	Nasturtium officinale	Su teresi	The whole plant is used.	Consumed fresh (Sarper et al., 2009)
Lamiaceae	Mentha aquatica	Su nanesi	Above ground parts	Consumed fresh (Sarper et al., 2009)
Fabaceae	Lupinus angustifolius	Yahudi baklası	Fruits	Decoction (Ugulu et al., 2009)
Linaceae	Linum usitatissimum	Keten	Seeds	Infusion (Ugulu et al., 2009)
Rosaceae	Crataegus meyeri	Roğık, Rığok	Roots	Decoction (Yeşil, Akalın, 2017)
Lamiaceae	Thymus fallax	Catır, Catri	Flowers and fresh shoots	Infusion, decoction (Yeşil, Akalın, 2017)
Lamiaceae	Thymus kotschyanus	Catır, Catri	Flowers and fresh shoots	Infusion, decoction (Yeşil, Akalın., 2017)



Lamiaceae	<i>Thymus sipyleus</i> subsp. <i>rosulans</i>	Catır, Catri	Flowers and fresh shoots	Infusion (Yeşil, Akalın, 2017)
Rosaceae	<i>Amygdalus communis</i>	Badem	Seeds	Consumed as raw and dried nuts (Yapıcı et al., 2009)
Aristolochiaceae	<i>Aristolochia bottae</i>	loğusa otu, goye deve	Above ground parts	Used in the form of mash in foot wounds due to diabetes (Yapıcı et al., 2009)
Orchidaceae	<i>Orchis simia</i>	Salep	Tubers are used.	Decoction (Yapıcı et al., 2009)
Anacardiaceae	<i>Rhus coriaria</i>	Sumak	Seeds	The seeds are squeezed and drunk. (Yaldız et al., 2010)
Ericaceae	<i>Vaccinium myrtillus</i>	Mavi Meyveli Ayı Üzüümü	Fruits and leaves	Infusion (Yaldız et al., 2010)
Asteraceae	<i>Matricaria chamomilla</i> var. <i>recutita</i>	Papatya	Flowers	Infusion (Tuzlaç et al., 2010)
Zygophyllaceae	<i>Paliurus spinachristi</i>	Kara çalı	Fruits	Decoction (Tuzlaç et al., 2010)
Plantaginaceae	<i>Plantago major</i> subsp. <i>major</i>	Sinirli ot, Sinirli yaprak	Leaves	Decoction (Tuzlaç et al., 2010)
Asteraceae	<i>Anthemis tinctoria</i> var. <i>tinctoria</i>	Sarıpapatya	Flowers	Decoction (Çakılcıoğlu, Türkoğlu, 2010)
Asteraceae	<i>Helichrysum plicatum</i> subsp. <i>plicatum</i>	Solmaz çiçek	Flowers	Decoction (Çakılcıoğlu, Türkoğlu, 2010)
Lamiaceae	<i>Salvia multicaulis</i>	Adaçayı	Flowers and leaves	Decoction (Çakılcıoğlu, Türkoğlu, 2010)
Papaveraceae	<i>Papaver rhoeas</i>	Gelincik	Flowers	Decoction (Çakılcıoğlu, Türkoğlu, 2010)
Poaceae	<i>Agropyron repens</i>	Ayrık	Rhizoms	Decoction (Çakılcıoğlu, Türkoğlu, 2010)
Portulacaceae	<i>Portulaca oleracea</i>	Semizotu	Leaves	Decoction (Çakılcıoğlu, Türkoğlu, 2010)
Fabaceae	<i>Astragalus gummifer</i>	Geven	Roots	Decoction (Çakılcıoğlu, Türkoğlu, 2010)
Liliaceae	<i>Smilax excelsa</i>	Dikenucu, Melülcan	Shoots are used	Decoction (Koca and Yıldırım, 2010)
Cistaceae	<i>Cistus laurifolius</i>	Tavşanak,	Leaves	Infusion (Kargıoğlu et al., 2010)
Cistaceae	<i>Cistus parviflorus</i>	Tavşanak, tavşancık	Leaves	Infusion (Kargıoğlu et al., 2010)
Euphorbiaceae	<i>Euphorbia anacampseros</i> Boiss. var. <i>anacampseros</i>	Sütleğen	Above ground parts	Decoction (Kargıoğlu et al., 2010)
Lamiaceae	<i>Stachys annua</i> subsp. <i>annua</i>	Haciosman otu	Above ground parts	Infusion (Tuzlaç, 2011)
Asteraceae	<i>Achillea tenuifolia</i>	Çoban kirpiği	Leaves	Infusion (Altundağ, Öztürk, 2011)
Rosaceae	<i>Crataegus aronia</i> var. <i>aronia</i>	Gurmut	Fruits	Decoction (Altundağ, Öztürk, 2011)
Dipsacaceae	<i>Dipsacus laciniatus</i>	Pukıç	Roots	Decoction (Altundağ, Öztürk, 2011)
Apiaceae	<i>Ferula caspica</i>	Gırmızı bolu	Above ground parts	Decoction (Altundağ, Öztürk, 2011)
Apiaceae	<i>Ferula rigidula</i> subsp. <i>rigidula</i>	Çaşır	Above ground parts	It is used as porridge (Altundağ, Öztürk, 2011)

Asteraceae	<i>Gundelia tournefortii</i> var. <i>tournefortii</i>	Kenger	Body	Peels are peeled and eaten directly ( <a href="#">Altundağ, Öztürk, 2011</a> )
Asteraceae	<i>Jurinella moschus</i> subsp. <i>pinnatisecta</i>	Gazangulpu	Above ground parts	Decoction ( <a href="#">Altundağ, Öztürk, 2011</a> )
Rosaceae	<i>Malus sylvestris</i> subsp. <i>orientalis</i> var. <i>orientalis</i>	Alma	Fruits	Decoction ( <a href="#">Altundağ, Öztürk, 2011</a> )
Apiaceae	<i>Peucedanum longifolium</i>	Çaşır	Above ground parts	Pickled ( <a href="#">Altundağ, Öztürk, 2011</a> )
Caprifoliaceae	<i>Viburnum lantana</i>	Germeşo	Fruits	Decoction ( <a href="#">Altundağ, Öztürk, 2011</a> )
Apiaceae	<i>Zosima absinthifolia</i>	Bolu	Leaves	Decoction ( <a href="#">Altundağ, Öztürk, 2011</a> )
Asteraceae	<i>Artemisia vulgaris</i>	Pelinotu	Above ground parts	Decoction ( <a href="#">Altundağ, Öztürk, 2011</a> )
Rosaceae	<i>Cerasus mahaleb</i> var. <i>mahaleb</i>	Mahlep	Fruits	Decoction ( <a href="#">Çakılcıoğlu et al., 2011</a> )
Rosaceae	<i>Cotonoaster nummularia</i>	Karagöz	Fruits	Decoction ( <a href="#">Yeşilada, Sezik., 2011</a> )
Asteraceae	<i>Cichorium intybus</i>	Hindiba, Mavihindiba, Radika, Sakizotu	Flowers and leaves	Decoction ( <a href="#">Kızılarşlan, Özhatay, 2006</a> )
Rosaceae	<i>Laurocerasus officinalis</i>	Karamiş, Karayemis.	Fruits	It is consumed fresh ( <a href="#">Kızılarşlan, Özhatay, 2006</a> ).
Asteraceae	<i>Achillea schischkinii</i>	Civan perçemi	Flowers	Decoction ( <a href="#">Tetik et al., 2013</a> )
Fabaceae	<i>Astragalus cephalotes</i> var. <i>brevicalyx</i>	Geven	Roots	Decoction ( <a href="#">Tetik et al., 2013</a> )
Rosaceae	<i>Armeniaca vulgaris</i>	Kayısı, mis mis	Fruits and seeds	It is eaten raw ( <a href="#">Tetik et al., 2013</a> )
Brassicaceae	<i>Eruca sativa</i>	Roka	Leaves	Salad is made ( <a href="#">Akaydın et al., 2013</a> )
Araceae	<i>Arum elongatum</i> subsp. <i>detruncatum</i>	Kardun, Kardı, Kardı	Leaves	Infusion ( <a href="#">Polat et al., 2013</a> )
Asteraceae	<i>Anthemis wiedemanniana</i>	Elık Fatık, Papatya	Bracts	Infusion ( <a href="#">Polat et al., 2013</a> )
Asteraceae	<i>Chaerophyllum bulbosum</i>	Pueşma, Şomek, Şomyek	Rhizomes	It is cooked and cooked ( <a href="#">Polat et al., 2013</a> )
Asteraceae	<i>Scorzonera cinerea</i>	Şing, Vil	Tubers	Decoction ( <a href="#">Polat et al., 2013</a> )
Boraginaceae	<i>Anchusa azurea</i>	Gelazun, Gelezun	Above ground parts and roots	Decoction ( <a href="#">Polat et al., 2013</a> )
Liliaceae	<i>Eremurus spectabilis</i>	Helug, Heluk, Gullık	Above ground parts	Cooked ( <a href="#">Polat et al., 2013</a> )
Fumariaceae	<i>Fumaria asejala</i>	Şahtere	Above ground parts	Cooked ( <a href="#">Kiliç, Bağci, 2013</a> )
Cistaceae	<i>Cistus creticus</i>	Pamukotu	Leaves	Decoction ( <a href="#">Akyol, 2013</a> )
Asteraceae	<i>Cirsium arvense</i> subsp. <i>vestitum</i>	At dikenı	Flowers	Infusion ( <a href="#">Saraç et al., 2013</a> )
Rosaceae	<i>Fragaria vesca</i>	Kandu	Fruits	It is consumed fresh ( <a href="#">Saraç et al., 2013</a> )
Solanaceae	<i>Physalis alkekengi</i>	Altın çilek, Gelifeneri	Fruits	Decoction ( <a href="#">Saraç et al., 2013</a> )

Apiaceae	<i>Eryngium campestre</i> var. <i>virens</i>	Kaplumbağa otu	Body	Consumed fresh (Sarper et al., 2009)
Asteraceae	<i>Carduus pycnocephalus</i>	Su dikenli, Soymaç	Body	Consumed fresh (Sarper et al., 2009)
Adoxaceae	<i>Viburnum opulus</i>	Gilaburu, girebolu	Fruits	Juice is removed (Korkmaz et al., 2014)
Fabaceae	<i>Trigonella foenum-graecum</i>	Çemen	Seeds	Butter tea is brewed (Korkmaz et al., 2014)
Apiaceae	<i>Diplotaenia cachrydifolia</i>	Siyabo	Above ground parts	It joins the cheese. Boiled and stored in salt water for a long time and that shape is used (Uceand Tunçtürk, 2020)
Apiaceae	<i>Petroselinum crispum</i>	Maydonoz	Leaves	Decoction (Bulut et al., 2014)
Apiaceae	<i>Peucedanum longifolium</i>	Domuz rezenesi	Above ground parts	It is pickled (Bulut et al., 2014)
Fagaceae	<i>Quercus ithaburensis</i> subsp. <i>macrolepis</i>	Meşe palamutu, Berri	Fruits	Decoction (Akan, Sade Bakır, 2015)
Lamiaceae	<i>Salvia aramiensis</i>	Adaçayı	Leaves	Infusion (Altay et al., 2015)
Cactaceae	<i>Opuntia ficus-indica</i>	Frenk Yemişi	Fruits	Eaten raw (Altay et al., 2015)
Lamiaceae	<i>Origanum syriacum</i>	At kekiği	Leaves	Infusion (Altay et al., 2015)
Apiaceae	<i>Daucus carota</i>	Arnamus otu, Kokar ot, Mayasıl otu	Above ground parts	Infusion (Bulut, 2015)
Apocynaceae	<i>Gymnema sylvestre</i>	Gimneya	Leaves	A decoction (Esen et al., 2015)
Fabaceae	<i>Galega officinalis</i>	Keçisedef otu	Above ground parts	Infusion (Özdemir, Alpınar, 2015)
Dennstaedtiaceae	<i>Pteridium aquilinum</i>	Eğrelti, eğrelti otu	Above ground parts and leaf	Infusion (Sargin, 2015)
Rhamnaceae	<i>Rhamnus rhodopeus</i> subsp. <i>anatolicus</i>	Yağlıcan çehri, Karaköken	Fruits	It is consumed fresh (Arı et al., 2015)
Apiaceae	<i>Apium graveolens</i>	Kereviz	Leaves and seeds	Infusion (Güler et al., 2015)
Solanaceae	<i>Solanum tuberosum</i>	Patates	Tubers are used	It is packed (Han, Bulut., 2015)
Asteraceae	<i>Tripleurospermum parviflorum</i>	Koyungözü, Papatya	Flowers	Decoction (Akgül et al., 2016)
Lamiaceae	<i>Melissa officinalis</i>	Melisa, oğul otu	Leaves	Infusion (Durmuş et al., 2016)
Rosaceae	<i>Rubus caesius</i>	Büküzümü	Leaves	Infusion (Bulut et al., 2017)
Aspleniaceae	<i>Ceterach officinarum</i>	Hüdaverdi otu	Above ground parts	Infusion (Yeşilyurt et al., 2016)

### 3. Results and discussion

Plants especially medicinal and aromatics are used by the mankind since its origin on the earth for different ailments and for the maintenance of general health; since ancient times, plants remained major natural resource in the World. Diabetes is a condition that is characterized by high blood sugar levels. Most of people worldwide are affected by this common disease. Research on diabetes is ongoing. When a person develops diabetes, insulin deficiency or the body's inability to consume it causes the sugar to remain in the blood instead of reaching the cells and producing



energy. This excess amount of sugar in the blood causes the blood sugar level to exceed normal level. Before the discovery of insulin and hypoglycemic drugs, diabetic patients were treated with medicinal plants and traditional treatments. So far, the positive effects of over 1200 herbal drugs in reducing blood glucose levels or the complications due to hyperglycemia have been established. Each plant may have its own effective component to reduce hyperglycemia. However, these plants have been shown to possess biological activities.

In this study, 147 plant taxa were determined for use in the treatment of diabetes in Turkey ethnobotany. In addition, as a result of field studies from Çelikhan (Adıyaman-Turkey) provinces in the 2019–2020 years 39 plant taxa (*Juniperus oxycedrus* subsp. *oxycedrus*, *Quercus coccifera*, *Teucrium polium*, *Rosa canina*, *Urtica dioica*, *Malva neglecta*, *Morus nigra*, *Rheum ribes*, *Rubus sanctus*, *Tribulus terrestris*, *Thymbra spicata*, *Rumex acetosella*, *Artemisia absinthium*, *Thymus praecox* subsp. *scorpiii*, *Cnicus benedictus* var. *benedictus*, *Scorzonera semiciana*, *Teucrium chamaedrys* subsp. *sinuatum*, *Hypericum perforatum*, *Vicia ervilia*, *Carduus pynoccephalus* subsp. *pynoccephalus*, *Nasturtium officinale*, *Crateagus meyeri*, *Thymus kotschyanus* var. *kotschyanus*, *Amygdalus communis*, *Paliurus spina-christi*, *Plantago major* subsp. *major*, *Anthemis tinctoria* var. *tinctoria*, *Helichrysum plicatum* subsp. *plicatum*, *Salvia multicaulis*, *Agropyron repens*, *Papaver rhoas*, *Portulaca oleracea*, *Astragalus gummifer*, *Gundelia tournefortii* var. *tournefortii*, *Cichorium intybus*, *Anchusa azurea* var. *azurea*, *Eryngium campestre* var. *virens*, *Trigonella foenum-graecum*, *Tripleurospermum parviflorum*) were collected from their habitat have potential to be used in the treatment of diabetes. Hence, these important medicinal plants may also have anti-diabetic activities and/or can reduce diabetes complications.

We hope that this study will serve as a guide for the diabetes remedy. When bioactivity studies on these plants are examined, it has shown that they have hypoglycemic effects and can be used to treat various types of the disease with different mechanisms. From the ancient times medicinal and aromatic plants are used for the treatment of many diseases like diabetes. By utilizing the ethno botanical and ethno pharmacological knowledge we know about the medicinal plants which have potent antidiabetic activity. It is necessary to use these herbs consciously in the treatment of diabetes. The more significant reason is that medicinal plants provide rational means for the treatment of many illnesses that are obstinate and incurable in other systems of medicine. These aromatic and medicinal plants often exert a distinctive effect for some diseases including diabetes mellitus. So, it would be interesting to discover new lead constituents for future drug development from the traditional Turkish medicines. Antidiabetic plant taxa can be used as alternatives to synthetic oral hypoglycemic drugs with less or even no prominent side effects. Folklore medicinal plants are mostly used for rural areas; because the availability of lavish amount of medicinal plants those areas. Therefore, treating diabetes mellitus with plant derived compounds which are accessible and do not require laborious pharmaceutical synthesis seems highly attractive. Current research of the antidiabetic activity of the herbs helps to develop effective herbal therapies for such purpose. For the discovery of new potential antidiabetic compounds suitable information about medicinal plants are needed. This article is prepared for providing proper information regarding the medicinal plants having antidiabetic property. The informations which are discussed here regarding the medicinal plants might be helpful for further research on diabetes. Further studies should be carried out to investigate the antidiabetic activity of other plant species that have not yet been studied, and also the bioactive compounds responsible for the antidiabetic activity need to be evaluated.

#### 4. Conclusion

In Turkey, ethnobotanical studies and studies similar to this study are extremely needed in terms of human health and other purposes. Our country is rich in natural plant species. Recognizing and owning this richness is a sensitive issue that needs to be emphasized in order to protect our plant diversity, nature, nutrients and health. Negative effects on plants should be minimized by raising awareness of the local people about the issues that cause negative effects on plants.

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