Lazaroa
ISSN: 0210-9778

http://dx.doi.org/10.5209/LAZAROA.51854

EDICIONES COMPLUTENSE

Contribution to the ethnobotanical study of antidiabetic medicinal plants of the Central Middle Atlas region (Morocco)

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Received: 09 January 2016 / Accepted: 27 May 2016

Abstract. An ethnobotanical survey of medicinal plants was carried out in the Central Middle Atlas in the years 2013 and 2014 to establish the catalog of medicinal plants used in traditional medicine in the treatment of diabetes. Thus, 1560 people were interviewed, using questionnaires. The latter enabled us to gather information on traditional healing practices of the local population including scientific name, French name, vernacular name, plant parts used , therapeutic indications , revenues and mode of administration. The results show that 76 medicinal species were inventoried in the study area. These plant species are included into 67 genus and 40 families. The most represented families are: *Lamiaceae* (12 species), *Asteraceae* and *Brassicaceae* species with 14 each. Of 76 medicinal species found in the region, four species are reported for the first time in the traditional treatment of diabetes in Morocco. They are *Pistacia atlantica, Ptychotis verticillata, Anacyclus pyrethrum, Alyssum spinosum, Cistus albidus*, *Juniperus thurifera, Ephedra nebrodensis, Thymus algeriensis, Th. munbyanus, Th. zygis, Abelmoschus esculentus, Fraxinus augustifolia, Sorghum vulgare* and*, Eriobotrya japonica*. The leaves are the most used organs (38%). The decoction is the dominant mode of preparation (50%) and administration is mostly for oral use (97%)
Keywords: medicinal plants; ethnobotany; diabetes; traditional medicine; Central Middle Atlas.

[es] Contribución al estudio etnobotánico de plantas medicinales antidiabéticas de la región central Oriente Atlas (Marruecos)

Resumen. Se ha realizado un estudio etnobotánico en el Medio Atlas Central durante los años 2013 y 2014. El objetivo ha sido establecer el catálogo de plantas medicinales utilizadas en la medicina tradicional para el tratamiento de la diabetes. 1560 personas fueron entrevistadas utilizando un cuestionario que nos permitió recoger información sobre las prácticas terapéuticas tradicionales de la población local, incluyendo nombre científico, nombre francés, nombre vernáculo, una o más partes de la planta utilizada, indicaciones terapéuticas, y modos de administración. Los resultados muestran 76 especies medicinales son utilizadas para tal fin en el área de estudio. Estas especies se agrupan en 67 géneros y 40 familias. Las más representadas son *Lamiaceae* (12 especies), *Asteraceae* y *Brassicaceae* con cuatro especies para cada una. De 76 especies medicinales encontradas en esta región, 14 se citan por primera vez en el tratamiento tradicional de la diabetes en Marruecos. Se trata de *Pistacia atlantica, Ptychotis verticillata, Anacyclus pyrethrum, Alyssum spinosum, Cistus albidus*, *Juniperus thurifera, Ephedra nebrodensis, Thymus algeriensis, Th. munbyanus, Th. zygis, Abelmoschus esculentus, Fraxinus augustifolia, Sorghum vulgare, Eriobotrya japonica*. Las hojas son las partes más utilizadas (38%). La decocción es el modo dominante de preparación (50%) y la administración es predominantemente por vía oral (97%).
Palabras clave: Plantas medicinales; etnobotánica; diabetes; medicina tradicional; Atlas medio-central.

Introduction

Worldwide, both in developed and developing countries, diabetes has been considered for several years as one of the scourges of the third millennium. Alarmingly, the number of people with diabetes continues to grow. There were 366 million diabetics in 2010 and 552

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million are expected in 2030 (Whiting, 2011). The World Health Organization (WHO) foresees that if we do not take urgent measures, diabetes deaths will increase by more than 50% over the next ten years.

Diabetes is a metabolic disease that is characterized by a disorder in the regulation of carbohydrate metabolism, resulting in a hyperglycemia. Originally, the term "diabetes" referred to various diseases that are characterized by a marked increase in urine excretion, dehydration and excessive thirst (Calop & *al.,* 2008). Blood glucose is the main parameter in diabetes mellitus; it is the level of glucose in the blood (Ménat, 2005). A person has diabetes when the fasting blood glucose is greater than or equal to 1.26 g/l. According to the cause of the disease (etiology), there are four types of diabetes mellitus, the most common types are diabetes type 1 and 2 (WHO, 2002). Type 1 diabetes (ex-insulin-dependent IDDM) accounts for about 10% of all cases of diabetes (WHO, 2002), most of them concern children, but it can occur at any age. Up to 90% of the normal amount of β cells secreting insulin is destroyed (autoimmune or idiopathic causes (Raccah, 2004; Calop & *al.,* 2008). Type 2 diabetes (non-ex -insulin dependent NIDDM) begins usually after the age of 40 and it represents 90% of all cases of diabetes (Buysschaert & *al.,* 1999; Raccah, 2004). It is a result of the inability of the body to respond properly to the action of insulin. Insulin is either low or high (predominant insulinopaenia or predominant insulin resistance) (Calop & *al.,* 2008; Raccah, 2004). The latter case leads to an increase in the hepatic production of glucose and a decrease in the translocation of glucose transporters in muscles (Schulman, 2000).

The Chronic hyperglycemia is associated with organic complications involving, particularly, eyes, nerves, kidneys, heart and blood vessels; these complications are what make diabetes mellitus very dangerous. All these adverse effects of hyperglycemia justify the need to balance, as perfectly as possible, the glucose levels in the blood (Jaspreet & *al.,* 2003). In fact, diabetes is a public health problem in many countries since it is an important cause of premature morbidity. It is a little known but a costly disease for the individual, the family and the community (Mangambu, 2014). Morocco is no exception to this global trend. Diabetes in Morocco is a major public health problem. Its prevalence has increased from 2.26% in 1976 to 6.6% in 2000. This increase is due to the epidemiological transition, characterized by a westernization of lifestyle, increasing obesity and stress (Karam, 2010).

Diabetes is considered as a public health priority given its clinical, human and financial major impacts. Also, the poor monitoring of people with diabetes often leads to their death (Kasali & *al.,* 2013a). The chronicity of this disease requires a lifelong, a very expensive and well followed treatment for a diabetic, using a combination of several therapies (Bouxid, 2012) and a regular self-monitoring (Mangambu & *al.,* 2012; Singh & Singh, 2012).

Moreover, in African developing countries, the medical management of diabetes is limited by the inaccessibility of certain populations to health centers and the high cost of conventional medicine. Under these conditions, people often use medicinal plants to heal. Also, there are problems of intolerance, hypersensitivity and resistance, things which are associated with antidiabetic drugs (Jayakumar & *al.,* 2010).

In addition, plants are increasingly recognized as a wonderful source of medication. Currently, 1200 species of plants are used as drugs for the traditional therapy of diabetes (Marles & Farnsworth, 1995).

Facing the expansion of this disease and its highly expensive care, the WHO, in its resolution of 31st August 2000, encouraged African countries to promote regional pharmacopoeia and traditional medicine, to ensure their primary health care needs. To this end, an ethnobotanical study of medicinal plants was carried out in the Central Middle Atlas region. This study helps to identify antidiabetic medicines and to provide a database of medicinal plants, in order to preserve the ancestral knowledge that is essentially based on an oral tradition. This knowledge contributes undoubtedly, to a better understanding of plant resources, which leads to a rational and sustainable exploitation, that takes into account the equitable sharing of products for the common good of local stakeholders and the community development of their lands.

Material and methods

Study area

The Central Middle Atlas region represents the ethnobotanical and floristic study area of the

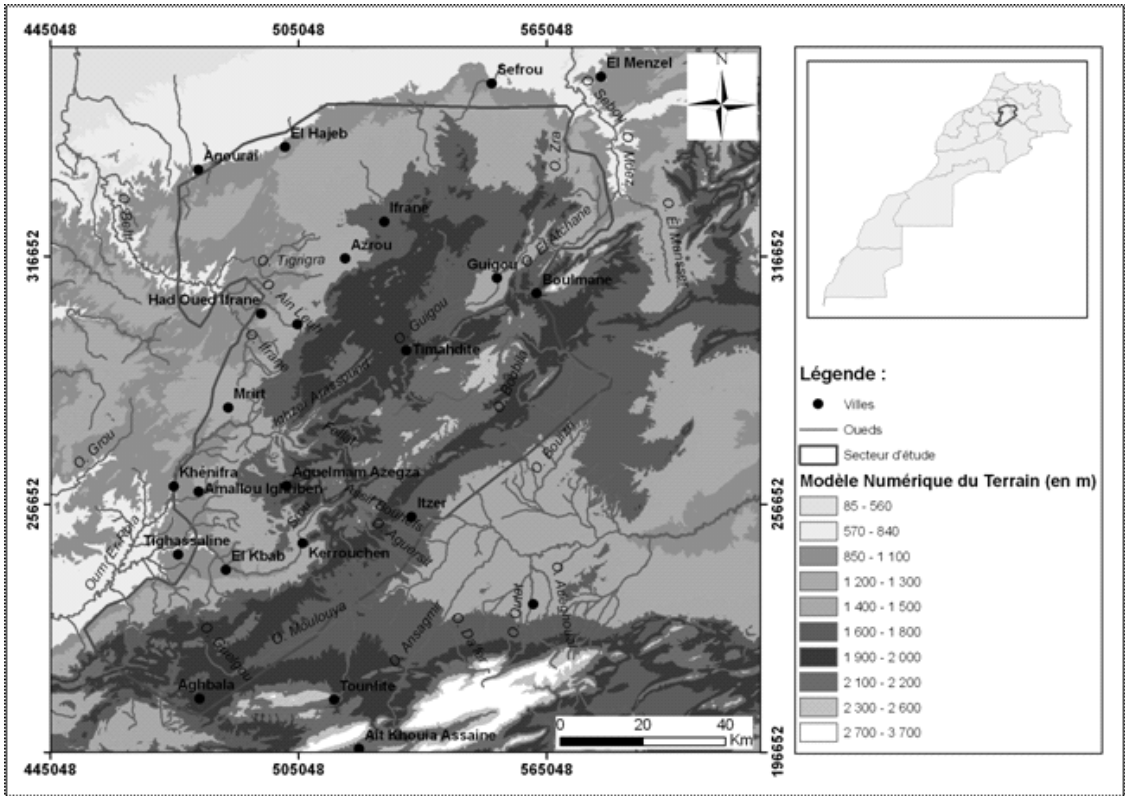

Figure 1. Location of the Central Middle Atlas region.

antidiabetic medicinal plants used by its population (Figure 1). The Middle Atlas is part of the field of Atlas chains (Michard, 1976). It occupies an intermediate position between the Rif to the north, and the High Atlas to the south. Along an EW section, the Middle Atlas is bordered by the high plateaus of the Oran-Moroccan meseta to the east and the coastal meseta to the west. To the north, it is limited by the plain of Sais (Neogene sediments) and the front of the nappe Rifain. To the northeast, it is limited by the basin of Guercif and to south and southeast, it is limited by the depression of Moulouya (Arboleya & *al*., 2004).

Globally, the Middle Atlas structure corresponds, on one hand, to large synclinal basins with axes that are parallel to the chain and, on the other hand, to narrow anticlinal ridges, sometimes, intruded with gabbroic rocks (Fedan, 1988). It consists of two structural assemblies that are separated by the North Middle Atlas fault (Arboleya & *al*., 2004): The tabular Middle Atlas or Middle Atlas plateau to NW and the folded Middle Atlas to SE. The first it is mainly formed by a Paleozoic basement covered with a large Mesozoic cover, all of it is dotted with scattered volcanic effusions of the quaternary age (Texier & *al*., 1985; Herbig, 1988). The folded Middle Atlas corresponds to the east part of the chain, it is distinguished from the sub-tabular plateau by the presence of ridges that form reliefs, and those reliefs are pointing toward the chain direction. These anticline ridges, framing the synclinal depressions, continued to function, during the Middle Jurassic, as depocentres and quite thick calcareous marls (Fedan, 1988). The climate in the Middle Atlas is of a mountain Mediterranean type, it is characterized by a wet and cold climate. That unique climate is due to its altitudinal position, its location and exposure to marine influences (Martin, 1981). The Middle Atlas, known as the key water tower of Morocco, is the mountain range that is the better watered and with the richest wetlands, including natural lakes, rivers and fresh sources, offering varied ecological habitats and fostering a great biodiversity (Chillasse & Dakki, 2004).

The Middle Atlas is generally very rich in plant species, because of the great diversity of

the ecosystems held within this area (forests, grasslands, scrublands, steppes, wetlands, saline soils). The Phytocenoses found there are organized by the following tree species: *Cedrus atlantica* (Atlas cedar), *Quercus faginea* (Zeen oak), *Quercus suber* (cork oak), *Quercus rotundifolia* (green oak), *Tetraclinis articulata* (Barbary thuja), *Juniperus thurifera* (Spanish juniper), *Pinus halepensis* (Aleppo pine), *Pinus pinaster* var. *maghrebiana* (Maghreb maritime pine) and spiny Xerophytes.

The Moroccan endemic tree species found in the Middle Atlas are *Juniperus phoenicea, Juniperus thurifera and Ceratonia siliqua* (Chillasse & Dakki, 2004). Two major biogeographic zones are distinguished in the Middle Atlas (Lecompte, 1986):

1) The Area occupied by vegetation that is adapted to the wetter climate conditions. It takes place throughout west and northwest of the Guigou plain, on the limestone causse plateaus of the Middle Atlas and their northern foothills.

2) Zones of xeric vegetation of the folded Middle Atlas and its borders (Moulouya and Sebou rivers).

Methodology

In order to identify medicinal herbs and gather all information on the therapeutic uses that are practiced by the local population of the Central Middle Atlas region, an ethnobotanical survey was conducted between 2013 and 2014 using a pre-quiz sheet with specific questions about the common name of each species, the used part, methods of preparation, methods of administration and the treated disease. The towns, villages and Douars (small villages) of the surveyed area are determined through the probabilistic stratified sampling techniques (Godron, 1971, 1982).

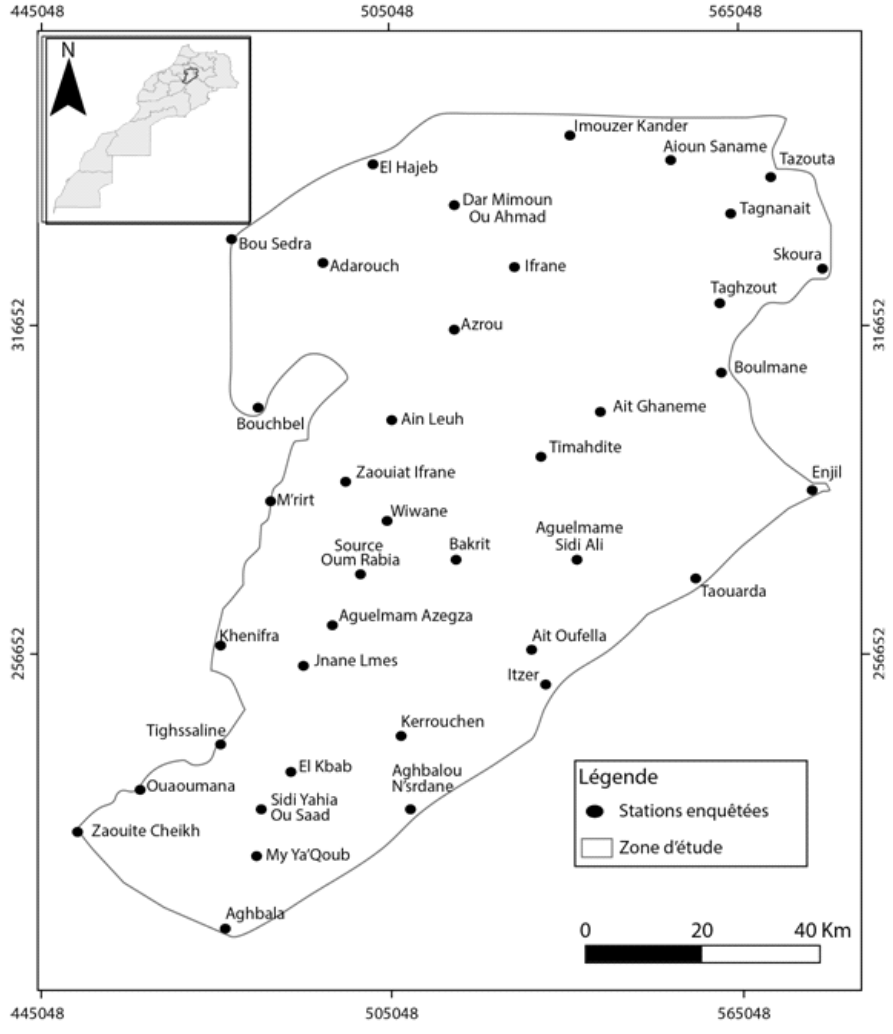

Figure 2. Map of the study area showing the surveyed stations.

The study area is divided into 39 homogeneous strata: Immouzer kandar, Aïoun sename, El hajeb, Tazouta, Dar Mimoun Ou Ahmed, Tagnanaït, Bou Sedra, Adarouch, Ifrane, Skoura, Taghzout, Azrou, Boulmane, Bouchbel, Aïn Leuh, Aït Ghanem, Timahdite, M'rirt, Zaouit Ifrane, Enjil, Wiwane, Sources Oum Rabia, Bakrit, Aguelmama Sidi Ali, Taoureda, Aguelmam Azegza, Khénifra, Jnane lmes, Aït Oufella, Itzer, Kerouchen, Tighssaline, El Kebab, Ouaoumana, Sidi Yahya Ou Saad, Aghbalou N'serdane, Zaouit Cheikh, Moulay Ya'qoub and Aghbala (Figure 2). By adopting a stratified random sampling, the survey was conducted among 1560 people, randomly selected from the population of the study area, with a sample of 40 individuals per stratum. This helped to sort the antidiabetic medicinal plants; however, this list enables a monograph of these plants according to the family, the scientific name, the common name and the local therapeutic use.

Results and Discussion

In the case of diabetes, there is variety of plants originating in traditional medicine with antidiabetic effects. In fact, many drugs known on the market are derived from a plant extract. The Galegine (antihyperglycemic agent) isolated from *Galega officinalis* L. (*Fabaceae*). The Galegine has served as a synthesis model of Metmorfin and other antidiabetic drugs (Sneader, 1985). Recently, diabetologists concluded that a therapeutic complement consisting of plant extracts is necessary to optimize the diabetes treatment (Bagchi & *al*., 1997. Kim & *al*., 2002; Jin & *al*., 2008). The ethnobotanical study is of great importance in the search for new Herbal active substances that can deal with problems, for which, the conventional medicine have no answers yet.

Thus, the floristic analysis of the catalog that was developed during this ethnobotanical study has identified 76 species distributed in 40 botanical families and 67 genera (Appendix 1). These species are divided into the following systematic groups: gymnosperms are represented by two families (*Cupressaceae, Ephedraceae*), three genera (*Juniperus*, *Tetraclinis*, *Ephedra*) and four species (*Juniperus phoenicea*, *J. thurifera*, *Tetraclinis articulata* and *Ephedra nebrodensis*). Angiosperms include 38 families, 64 genera and 72 species. Among these latter, Dicotyledons are dominant with 65 species and Monocotyledons are dominant with 7 species. Among the 40 identified families, some are more represented than others in this region: *Lamiaceae* (12 species), *Asteraceae* and *Brassicaceae*, each with 4 species and which are also the richest families in Morocco. While families *Apiaceae*, *Cucurbitaceae*, *Cupressaceae*, *Fabaceae*, *Oleaceae* and *Poaceae* include only 3 species each one. The *Thymus* genus is the most represented with 4 species, *Allium*, *Pistacia*, *Brassica* and *Juniperus* are represented by two species. Those results are similar to those already obtained by Orch & *al*. (2015) in the region of Izarène, but they are slightly different from those reported by Ghourri & *al*. (2013) in the Moroccan Sahara and Benkhnigue & *al.* (2014) in Al-Haouz Rhamna region. In fact, these studies have shown that families *Fabaceae* and *Asteraceae* are the most represented. This can be comprehensible because the geographical area of studies is different. The indicated dosage is based primarily on a clear predominance of leaves as the most used plant organs (38%), it is maybe due to their availability throughout the year, their easy access, removal and manipulation (Trabi & *al*., 2008), the decoction is the most used way (50%). The remedy is, almost, always administered orally (97%); this requirement can be explained by the fact that this disease is linked to deep organs. To reach them, any compound must pass through the digestive system to facilitate its assimilation (Trabi & *al.,* 2008). These results are consistent with those reported by Ghourri & *al.* (2013) in the Moroccan Sahara, by Benkhnigue & *al*. (2014) in the Al-Haouz Rhamna region and by Orch & *al.* (2015) in the region of Izarène.

Comparing the results with those of previous studies (Bellakhdar, 1997; Ghourri & *al*., 2013; Benkhnigue & *al*., 2014; Orch & *al*., 2015) we can confirm the existence of 14 unreported medicinal species in the traditional treatment of diabetes such as *Pistacia atlantica, Ptychotis verticillata, Anacyclus pyrethrum, Alyssum spinosum, Cistus albidus*, *Juniperus thurifera, Ephedra nebrodensis, Thymus algeriensis, Th. munbyanus, Th. zygis, Abelmoschus esculentus, Fraxinus augustifolia, Sorghum vulgare and Eriobotrya japonica*. This can be explained by the richness and diversity of the medicinal flora of the Central Middle Atlas that is characterized by a particular geographical position, orography, edaphic structure and geological and climatic conditions.

Despite the therapeutic effects of Medicinal plants, they should be used with great caution, since they may have a toxicity risk (Fouché & *al*., 2000). They are complex mixtures of various molecules. Their often poorly defined composition is formed by molecules with a known biological activity, these components may, to a certain degree of concentration, present an intrinsic toxicity. Like all compositions of plant products, which vary in many ways, the content of these constituents can naturally vary from one preparation to another. In fact, during our investigation, herbalists have reported a risk of toxic effects when talking about colocynth (*Citrullus colocynthis*), oleander (*Nerium oleander*) and spurge (*Euphorbia resinifera*).

Conclusion

Diabetes is the first non-communicable disease to be recognized by the United Nations as a threat to global health. It was defined as dangerous as the infectious epidemics such as: malaria, tuberculosis and AIDS. It is a disabling and costly chronic disease with serious complications; it presents severe risks for families, Member States and the whole world. Thus, the coverage of medical expenses becomes a real social problem, especially in developing countries, such as Morocco, where the low economic system induces insufficient resources. The use of, readily, available local resources constitutes a suitable palliative alternative. In this context, an ethnobotanical study has been conducted in the Central Middle Atlas region, and helped to identify a list of hypoglycemic medicinal plants used by the population of the study area. This investigation has helped to set up an inventory of 76 antidiabetic species used by the local population, including 14 antidiabetic species that are listed for the first time in Morocco. This ethnobotanical study will be useful to scientists for further study. These studies will help the isolation and identification of active ingredients that could lead to diabetes medications for the welfare of diabetics.

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Appendix 1. Catalog of antidiabetic medicinal plants.

Family	Scientific name	French name	Vernacular name	Parts used	Usage traditionnel local Local medicinal usages
Amaranthaceae	*Chenopodium ambrosoides* L.	Chénopode	Mkhinza	The whole plant	Decoction / A glass every day
Amaryllidaceae	*Allium cepa* L.	Oignon	Lbesla / Azalim	bulb	Raw
	Allium sativum L.	Ail	Toum / Tichert	bulb	Raw
Anacardiaceae	*Pistacia atlantica* Desf.	Pistachier de l'atlas	Lbtem / Ijj	Leaves/ Ecorce	Decoction/ A glass in the morning after breakfast
	Pistacia lentiscus L.	Lentisque	Trou	Leaves/ Ecorce	Infusion / Decoction
Apiaceae	*Ammi visnaga* L.	Khella	Bachnikha / Barghanisse	Inflorescence (umbel)	Decoction
	Daucus carota L.	Carotte cultivée	Khizou	Root	Juice / Puree
	Ptychotis verticillata Dub.	Ammi ptychotis	Nounkha	Aerial part	Infusion
Apocynaceae	*Caralluma europaea* (Guss.) N.E. Br.	Carallume d'europe	Daghmus	Leaves	The orange juice or with milk /Raw
	Nerium oleander L.	Laurier rose	Defla / Allili	Leaves	Set foot in the decoction/ add the decoction in bath water /Put the leaves in shoes
Arecaceae	*Chamaerops humilis* L.	Palmier doum/ Palmier nain	Doum / Tiguezden / Ignadd	Root	Raw / Cooked
	Phoenix dactylifera L.	Palmier-dattier	Tmar / Nakhla / Tazdâyet / Tînî/	Root	Decoction / A glass every day
Asparagaceae	*Asparagus albus* L.	Asperge blanche	Sekkum / Azzu	Young sprouts	Raw
Asteraceae	*Anacyclus pyrethrum* L.	Pyrètre d'afrique	Iguntas / Tagundecht	Root	Infusion / powder / A glass in the morning after lunches
	Artemisia herba-alba Asso.	Armoise blanche	Chih / Ifzi / Izri	Leaves	Infusion / A glass per daily for one month
	Dittrichia viscosa (L.) Greuter	Aunée visqueuse	Terehla	Leaves	Decoction / A glass per daily for one month
	Scolymus hispanicus L.	Scolyme d'Espagne	Gûrnina / Taghdiût	Leaves/ Stem	Raw stem or cooked /Leavees decoction
Brassicaceae	*Alyssum spinosum* L.	Alysson épineux	Aguerbaz	Stem with leaves	Decoction
	Anastatica hierochuntica L.	Rose de Jéricho	Chajarat maryem	Stem with leaves	Powder, associated with *Rosmarinus officinalis*, in Decoction
	Brasica oleracea L	Chou	Krumb	Leaves	Raw
	Brassica rapa L.	Navet	Left beldi	Root	juice decocted
Buxaceae	*Buxus balearica* Lam.	Buis des baléares	Azazer / lbakous	Leaves	Decoction
Cactaceae	*Opuntia ficus indica* (L) Mill.	Figuier de barbarie	Handiya/ za'boul	Leaves/ Flowers/ Fruit	juice small fresh leaves with milk / Flowers associated with honey powder / The fruit is used as an antidiabitic
Capparaceae	*Capparis spinosa* L.	Câprier	Kabâr / Taylulut	Aerial part	Decoction/ Infusion
Caryophyllaceae	*Corrigiola telephiifolia* Pourr.	Corrigiole à feuilles de téléphium	Sarghina / Tawsarghine	Root	The root powder incorporated in bread
Cistaceae	*Cistus albidus* L.	Ciste blanc	Boutour	Leaves	Decoction

Cucurbitaceae	*Citrullus colocynthis* (L.) Schrader.	Coloquinte	Lhdej / Tafrzizte	Fruit/Seeds	The fruit divided in two and lightly heat is placed under the heels / Add the fruit decoction in bath water / taking a seed in the morning and evening is recommended against diabetes.
	Cucumis sativus L.	Concombre	Lkhiyâr	Fruit	The mixed juice "Lben" (fermented milk)
	Cucurbita pepo L.	Citrouille	Gar'a l-hamra / Takhsaït	Fruit	The decoction juice
Cupressaceae	*Juniperus phoenicea* L.	Genévrier de phénicie	L'araar finiqui	Leaves/ Young branch	Decoction
	Juniperus thurifera L.	Genévrier thurifère	Tawayt	Leaves/ Young branch	Decoction
	Tetraclinis articulata (Vahl) Mast.	Thuya de berbérie	L'araar	Leaves/ Young branch	Decoction
Ephedraceae	*Ephedra nebrodensis* Guss.	Ephédra	Timitrte	Leaves	Leavees decoction, associated to Apium *graveolens, and petroselinum sativum*.
Ericaceae	*Arbutus unedo* L.	Arbosier	Sasnu	Leaves	Decoction
Euphorbiaceae	*Euphorbia resinifera* Berg.	Euphorbe résinifère	Tikiwt	Leaves	A drop latex in a glass of water once a day.
Fabaceae	*Medicago sativa* L.	Luzerne	Fessa	Leaves	Cooked leaves
	Phaseolus vulgaris L.	Haricot	Lûbya	Fruit	Decoction juice
	Trigonella foenum-graecum L	Fenugrec	Lhalba	Seeds	Seeds, their flour or decoction is used conventionally in Morocco against diabetes.
Gentianaceae	*Centaurium erythraea* L.	Petite centaurée	Qusset el-hayya / ahchlaf n'tawrra	Flowering top	Infusion
Geraniaceae	*Pelargonium roseum* Willd.	Géranium-rosat	Laattercha	Stem with leaves	The stem with leaves in tea infusion.
Globulariaceae	*Globularia alypum* L.	Globulaire turbith/ Turbith blanc	A'yen lerneb / Taselgha	Leaves/ Stem with leaves	Decoction/ Infusion.
Juglandaceae	*Juglans regia* L.	Noyer	Swak / Gargaa	Leaves	Decoction
Lamiaceae	*Ajuga iva* (L.) Schreb.H.	Bugle- Ivette	Tûf tolba / Chendgoura	whole plant	Decoction
	Lavandula stoechas L.	Lavande pédonculé	Lhalhal	Aerial part	Decoction
	Marrubium vulgare L.	Marrube blanc	Mriwta / Mriwa	Aerial part	Infusion / Decoction
	Mentha pulegium L.	Menthe pouliot	Fliyyo	Leaves/ Stem with leaves	Infusion / Decoction
	Ocimum basilicum L.	Basilic	Lahbaq	Stem with leaves	Infusion
	Origanum compactum Benth.	Origan	Zaater	Stem with leaves	A decoction or infusion with two glasses per day: in the morning and evening.
	Rosmarinus officinalis L.	Romarin	Azir	Flowering stem	Infusion / Decoction
	Salvia officinalis L.	Sauge officinale	Salmiya	whole plant	Infusion / Decoction
	Thymus algeriensis Boiss. & Reut.	Thym	Aduchen / Azukni / Zaïtra	Stem with leaves	Infusion / Decoction
	Thymus munbyanus Boiss. & Reut.	Thym	Aduchen / Azukni / Zaïtra	Stem with leaves	Infusion / Decoction
	Thymus vulgaris L.	Thym	Aduchen / Azukni / Zaïtra	Stem with leaves	Infusion / Decoction
	Thymus zygis L.	Thym	Aduchen / Azukni / Zaïtra	Stem with leaves	Infusion / Decoction
Lauraceae	*Cinnamomum cassia* (Nees & T. Nees) J. Presl	Cannelle	Qarfa	Ecorce	Decoction in milk.

Linaceae	*Linum usitatissimum* L.	Lin cultivé	Zriaat al kettane	Seeds	Powder in warm water or milk.
Lythraceae	*Punica granatum* L.	Grenadier	Qchour romman	Pericarp	Decoction
Malvaceae	*Abelmoschus esculentus* (L.) Moench	Gombo	Lmloukhia	Fruit	Maceration of 2 or 3 fruits in a glass of water overnight to take fasting.
Moraceae	*Ficus carica* L.	Figuier	Karma / Tazarett	Leaves	Decoction
	Morus alba L.	Mûrier noir	Tût lbari	Leaves	Fresh leaves in infusion.
Myrtaceae	*Eucalyptus globulus* Labill.	Eucalyptus	Calitous	Leaves	Decoction
	Myrtus communis L.	Myrte	Rihane	Leaves	Infusion / Decoction
Oleaceae	*Fraxinus augustifolia* Vahl.	Frêne	Touzalt	Leaves	Infusion
	Olea europaea L.	Olivier	Zitoune	Leaves	Infusion
	Olea europaea var. sylvestris (Mill.) Brot.	Olivier sauvage	Azemmour/ zabouj	Leaves	Infusion
Poaceae	*Avena sativa* L.	Avoine cultivé	Khortal	Whole plant / Seeds	Infusion / Decoction
	Phalaris canariensis L.	Alpiste de canaries	Zwane	Seeds	Macerating 125 g of seeds in one liter of water overnight, drinking the mixture at morning.
	Sorghum vulgare Pers.	Sorgho	Bachna	Seeds	Infusion / Decoction
Ranunculaceae	*Nigella sativa* L.	Nigelle	Haba souda / sanouj	Seeds	Seeds 7 in number per day.
Rosaceae	*Eriobotrya japonica* (Thunb.) Lindl.	Néflier	M'zah	Leaves	The infusion for one drink each day for one month.
Rutaceae	*Ruta montana* L.	Rue des montagnes/ Rue sauvage.	L-Fijel / Iwermi	Stem with leaves	Decoction / one glass per day.
Sapotaceae	*Argania spinosa* L.	Arganier	Aqqa wargan	Seeds	Aseed per day.
Solanaceae	*Capsicum frutescens* L.	Piment enragé	Felfel Hârr/ soudania	Fruit	Chilli pepper consumption
Urticaceae	*Urtica pilulifera* L.	Ortie à pilules	Hurriga / Tisrakmaz	Leaves	Decoction
Zygophyllaceae	*Peganum harmala* L.	Harmel	Lharmel	Seeds	Infusion of some seeds.
	Zygophyllum gaetulum Enb. & Maire.	Zygophylle	L'aggâya	Leaves	Powder / Infusion.