DIVERSITY AND TRADITIONAL USE VALUE OF MEDICINAL PLANTS IN BOU SAADA DISTRICT OF M'SILA PROVINCE, SOUTH EAST ALGERIA

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Abstract

The study aimed at identifying the plants of Bousaada district of M'sila province, South East Algeria, used by the local people as traditional medicines and analyzing their use value. The ethno-medicinal use information was collected by interviewing local informants using structured questionnaires through regular field surveys. A total of 193 species belonging to 69 families was identified. Lamiaceae and Asteraceae were the most commonly reported medicinal plants with 85 and 71 species, respectively. *Artemisia herba-alba* and *Juniperus oxycedrus* were the most widely used plants as the traditional medicine by the local population. The highest use value (UV) was observed for *Citrus lemon* (L.) Burm., *Ficus carica* L., *Moringa oleifera* Lam. and *Olea europaea* L. (UV=5). The highest fidelity level (FL) value was for 73 species. The calculated informant consensus factor (ICF) showed that diseases related to gastrointestinal disorders and diseases of the glands attached to the digestive system diseases present the highest values.

Key words: Ethno-medicinal plants; Primary health care; Bousaada of M'sila province; Algeria.

INTRODUCTION

Over 80% of the population in developing countries depends directly on plants for their medical requirements and to meet their primary healthcare needs (WHO 2020). In developing countries, traditional medicines still a key element for the provision of primary health care especially where there are inadequate primary health care systems (Shrestha and Dhillion 2003). In Algeria, the available modern healthcare services are either insufficient or inaccessible and unaffordable to the majority of people.Many rural peoples possess a big traditional knowledge of medicinal plants. Such knowledge survives because it is transferred from one generation to another. Also, herbal medicines are believed to be affordable, accessible, culturally accepted (Karunamoorthi and Tsehaye 2012). As Algeria has diverse socio-economic, ethnic, linguistic and cultural areas, as well as unique biodiversity, the copious knowledge of indigenous medicinal plants and their use in treating human ailments might reasonably be expected. In addition, due to illiteracy and poverty, most of the Bousaada population is dependent on traditional phytomedicine to cure various diseases. Plants and their products are frequently used in various herbal medicine systems in the globe (Ishtiaq *et al.* 2010a, b). Algeria, with the vast area, estimated 2.382 million square kilometers, and the first richness in North Africa (Miara *et al.* 2018), with more than 3 139 species (Quézel and Santa 1962) is endowed with rich and diversified natural vegetation. The exploration and documentation of the significance of endemic and exotic flora is very imperative because plants are the part and parcel of

folklore medical and nutritive therapies with their historical and cultural perspectives from each area of the country. According to Reguieg (2011), the Algerian population used medicinal and aromatic plants to treat several ailments for centuries. Despite, the numerous studies published for the country as El Hadj *et al.* (2003), Hammiche and Maiza (2006), Hendel *et al.* (2012), (Chehma and Djebar 2008), Rebbas *et al.* (2012), Miara *et al.* (2013), Benarba *et al.* (2015), (Chermat and Gharzouli 2015), (Meddour and Meddour-Sahar 2015), Bouchikh *et al.* (2016), Ouelbani *et al.* (2016), Bendif *et al.* (2018), Miara *et al.* (2018), Miara *et al.* (2019a,b), Bendif *et al.* (2020), Bouhaous *et al.* (2021), Souilah *et al.* (2021a), Bendif *et al.* (2021) for ethnobotanical investigations still insufficient to document the ancestral knowledge Benarba *et al.* (2015), because of the large surface of Algeria. The region of Bousâada, situated on the Tillian Atlas and South of Chott-El Hodna, covers an area of 256 km^2 and is regarded as a gateway to the desert. In addition, it's characterized by many plant botanical resources, diverse medicinal plants, and several traditional healing practices. Bousaada is an excellent repository of cultural heritage and the use of plants as folklore medicines has been practiced since the beginning of human civilization. In this context, this study aims to deepen the knowledge of traditional botanical medicine for the use of medicinal plants in the area of Bousâada and its environs of Medjdel, Menaa, Tamsa, and Slim.

MATERIAL AND METHODS

Study area

Bousaada is located in M'sila province of South-East of Algiers (N 36° 42' 13", E 6° 51' 23", 260 km a.s.l. (Fig.1). It contains five municipalities: Mdjedel, Temsa, Menaa, Slim and Bousâada (Fig.1). It extends over 2257 km^2 of area; it includes a global population of 210181 inhabitants. Geographically, Bousaada region is limited to the North by the Hodna Mounts, to the South by the Ziban Mounts, to the East by the Belezma Mounts, and to the West by the Ouled Nail Mounts. The physical structure of the whole province is very heterogeneous. The local economy of Bousâada is based on agropastoral and tourist vocations essentially inherited from the French colonial era. The study region is characterized by two distinct natural regions: the steppe formed mainly by *Stipa tenacissima* L. and *Artemisia herba alba* Asso, characterized by sparse plant cover, reflecting the degree of degradation, and the Mountain area reserved for extensive mountain farming marked by the presence of the green oak (*Quercus ilex* L.) in the slopes. According to previous studies, the flora

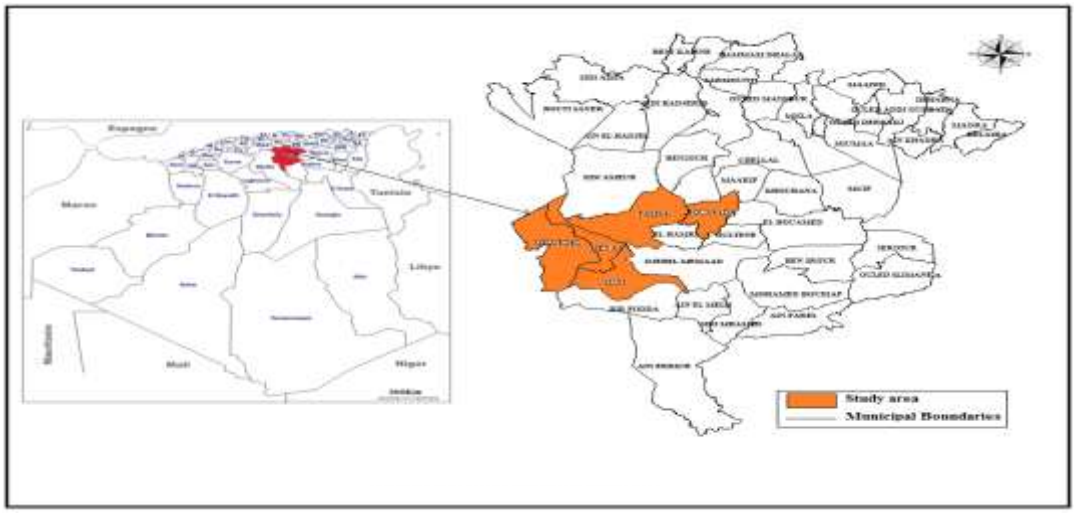

Fig.1. Location of study area (Rural regions of Bousaada; South Weast of Msila province, Algeria) (Municipalities of Mdjedel, Temsa, Menaa, and Bou Saada).

of therapeutic use in the region of M'sila was relatively large. Among the main plants, the families Lamiaceae, Asteraceae, Fabaceae, and Zygophyllaceae were found (Benkheira *et al.* 2005). The climate of the Bousaada region is a continental type subject in part to Saharan influences and characterized by a very hot summer and a very cold winter with low and irregular rainfall of around 260 mm/year. The annual average rainfall was 11.90 mm/year and the monthly average high temperature was 33°C in August and the coldest month was January represented by 8°C.

Species diversity and Ethnobotanical surveys

By interviewing informant's users with 534 structured questionnaires, regular field surveys were carried out face to face (Martin 1995), in the rural towns of Bousaada region during the period of two years (2020-2022), to obtain identifiable plants, local plant names and also to cross-check the information provided by the local informants. The interview was done without pressure to permit the participants to respond naturally (Akerreta *et al.* 2007). In this work, the questionnaire concerns the plants and their uses including the vernacular name. The approval of local knowledge holders to participate in the questionnaire was obtained as referred by the International Society of Ethnobiology (2006). The botanical identification of the specimens was made by Professor Miara (M.D.) consulting botanist of Tiaret University and related floras by Battandier and Trabut (1895), Maire (1952), Quézel and Santa (1962), Kaddem (1990), Aissa (1991), Dobignard and Chatelain (2010). An online database (www.theplantlist.org) was used for proving the scientific names and synonyms of the plants. Voucher specimens were established and deposited at the herbarium laboratory of the University of Tiaret.

Data analysis

The recorded data were reassigned to our internal database using common software (Excel) prepared by ourselves, then were analyzed and compared with numerous national and international ethnopharmacological references (articles, books, reviews in electronic databases: Science Direct, PubMed, and Google Scholar) to identify the similarities, differences, and new uses of unknown and well-known medicinal plants. Data collection was analyzed using three indices frequently used in previous studies of Abu-Irmaileh and Afifi (2003), Uddin and Hassan (2014), Benarba *et al.* (2015), and Miara *et al.* (2019a,b).

The use-value of species (UV)

A quantitative method that determines the relative importance of locally known species was calculated as follows:

$$\mathrm{UV} = \Sigma U/n.$$

Where "*U*" is the number of use citations by each informant for a given plant species; "*n*" the total number of informants interviewed for a given plant.

The UV is for the determination of the plants with the highest use in the treatment of an illness. The more the use reports for a plant, the high the UVs, and low when there are few reports related to its use (Abu-Irmaileh and Afifi 2003).

Fidelity Level (FL)

It is used to define the most commonly used plant species for the treatment of a particular disease category by informants in the area of study. It is calculated using the following formula by Martin (1995):

$$\text{FL} = (Np/N) \times 100$$

Where, "*Np*" is the number of used reports cited for a given species for a particular disease category; "*N*" is the total number of used reports cited for a given species.

Usually, high FLs are obtained for plants for which almost all used reports refer to the same way of using it, while low FLs are obtained the for plants that are used for many different purposes (Heinrich *et al.* 1998).

The Informant Consensus Factor (ICF)

It is applied to indicate how far the information is homogeneous. It is calculated as:

$$\text{ICF} = (Nur - Nt)/(Nur - 1)$$

Where, "*Nur*" is the number of used citations in each category; "*Nt*" represents the number of species reported in each category.

ICF values will be low (near 0) if plants are chosen randomly or if informants do not exchange information about their use. The values will be high (close to 1) if there is a well-defined selection criterion in the community and/or if the information is exchanged between informants (Kaya 2006).

RESULTS AND DISCUSSION

Diversity of species used

A floristic analysis conducted in the district of Bousaâda, using 534 questionnaires, allowed us to inventory a part of the flora wealth. The study area contains a total of 193 taxa distributed in 69 families (Table 1). The families' distribution is quite heterogeneous; 12 main botanical families predominating by their uses are: Lamiaceae (16 species), Fabaceae (14 species), Asteraceae (13 species), Apiaceae (12 species), Rosaceae (12 species), and Apiaceae (10 species) (Fig. 2). Our results substantiating the views of Hendel *et al.* (2012), Souilah *et al.* (2018).

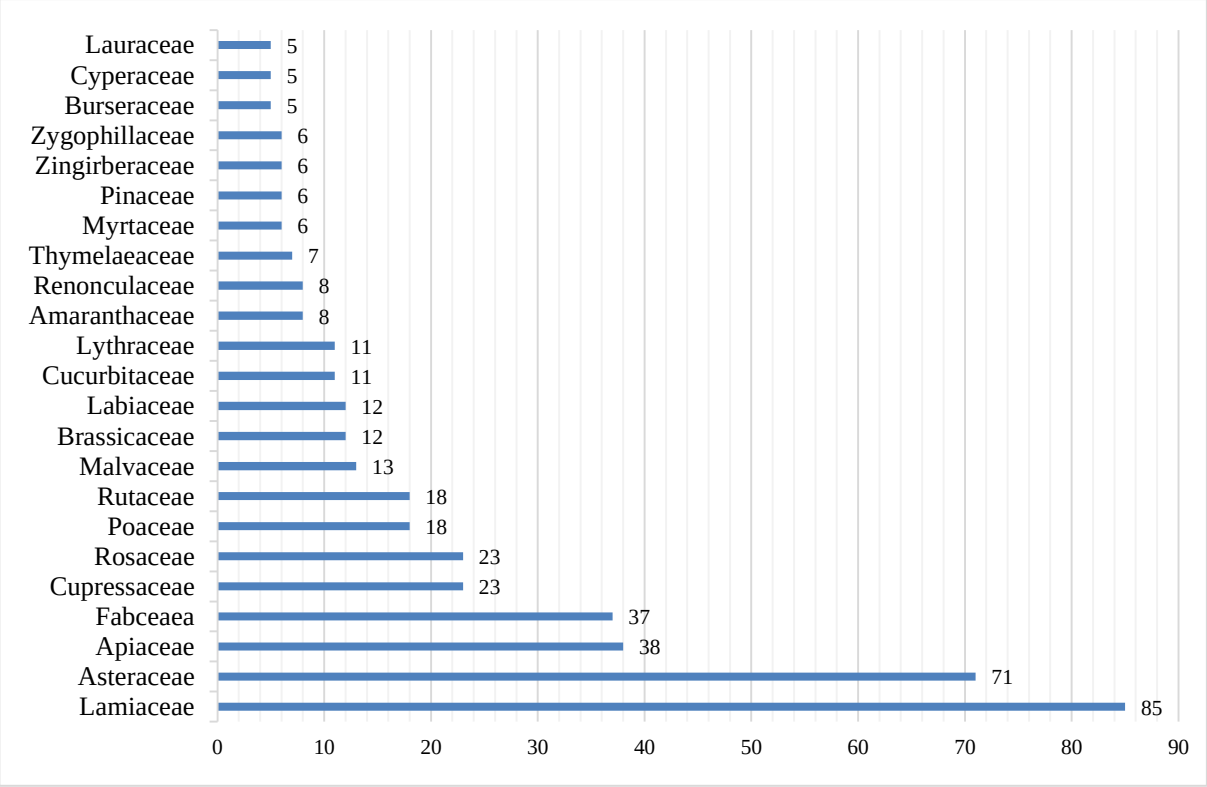

Fig. 2. Number of medicinal species according to botanical families.

According to our results, the most common plants used by the local population in the traditional medicines are *Artemisia herba-alba*, *Juniperus oxycedrus*, *Mentha viridis*, *Thymus vulgaris*, and *Artemisia vulgaris*, depending on the total number of reported uses cited for a given species (Fig. 3). This result supports the findings of Chermat and Gharzouli (2015) at Djebel Zdimm in the region of Sétif (Algeria) in which, they reported the most used plant was *Artemisia herba*-alba. On the other side, some herbs are weakly used because of their toxicity, such as rose laurel (*Nerium oleander*) and thapsia (*Thapsia garganica*).

The present study result (193 species) could be very interesting compared to other studies carried out in Algeria: 141 species in Mascara, 118 in Illizi, 112 in El Kala, 102 in Constantine and Mila, 83 in Bourdj Bou Arreridj, 98 in Kabylie region, 80 in Tassili Najjer, 78 in El Mansourah of province of Bourdj Bou Arreridj, 66 in Tiaret, 53 in Wed Righ and 37 in Ourgla by Ouelbani *et al*. (2016), Souilah *et al*. (2018), (Meddour and Meddour-Sahar 2015), Hammiche and Maïza (2006), Benarba *et al*. (2015), Bendif *et al*. (2018), Miara *et al*. (2013), Lakhdari *et al*. (2016), El Hadj *et al*. (2003), respectively.

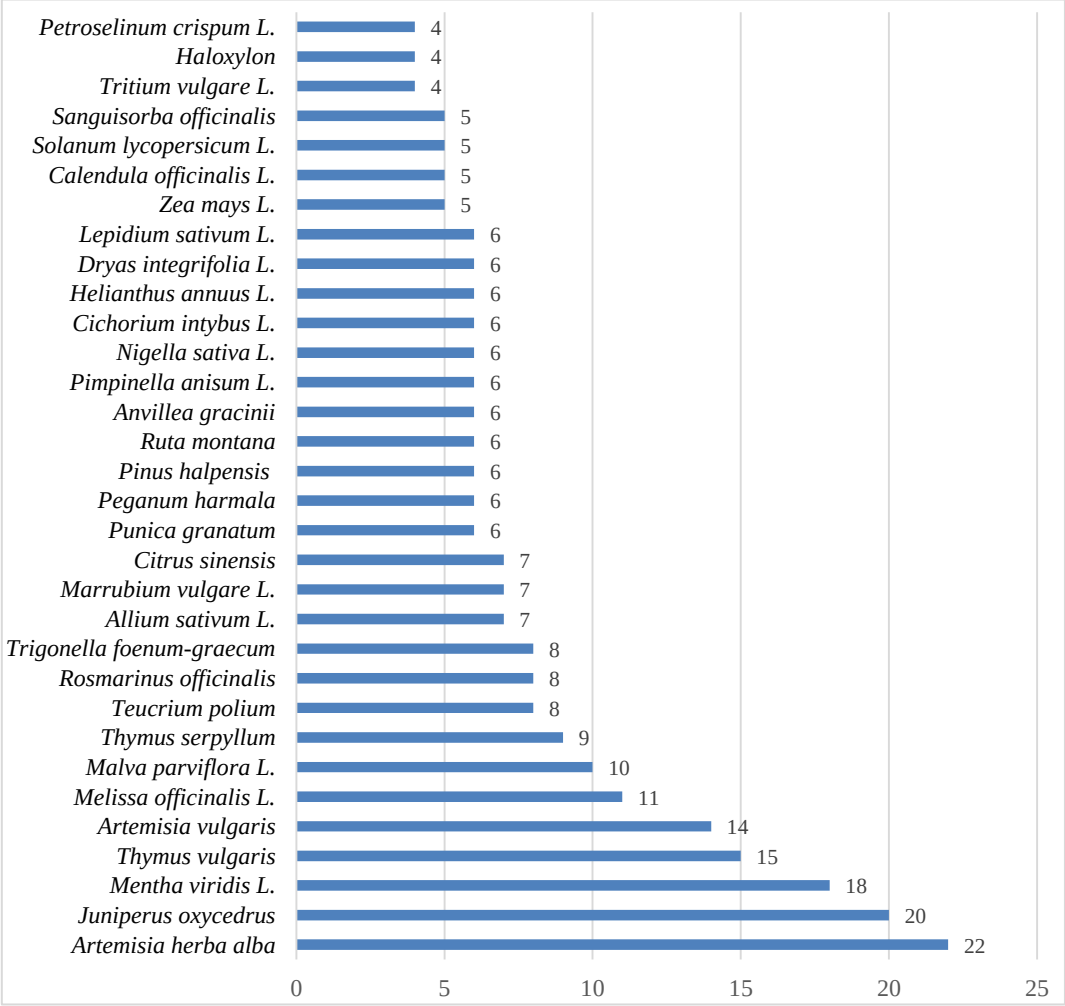

Fig. 3. The most commonly used plants according to the total number of reported uses cited for a given species by the local population.

Use of herbal plants according to the harvesting season

In terms of availability, 64% of the reported plants are only available in spring, 15% of the reported plants are permanent throughout the entire year (all seasons), 9% in summer, 8% in winter,

and only 4% in autumn (Fig. 4). The remaining species are only available partially, depending on favorable rainfall conditions. These results agree with those obtained by Chehma and Djebar (2008) in Ouargla (Algeria), who found that the spring season marks the highest percentage (72%).

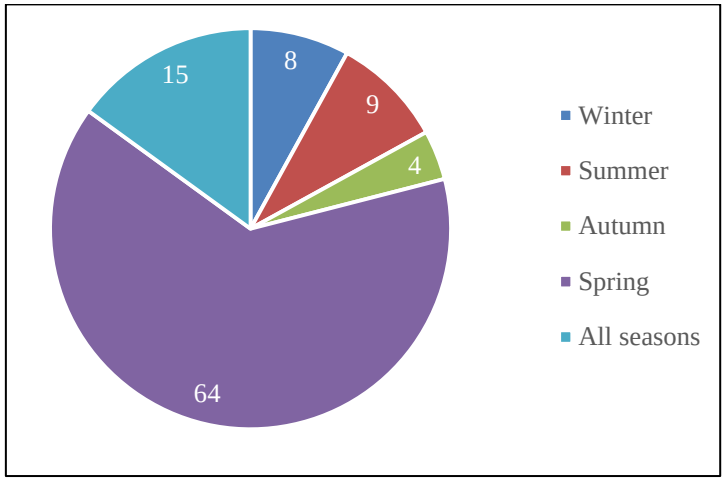

Fig. 4. Use of herbal plants according to the harvesting season

Use of herbal plants according to the type of plant

Depending on the type of the plants used, it has been noticed that the highest percentage is found in wild plants with 53% followed by cultivated plants with 45%, while the lowest percentage is obtained in exotic plants (Fig. 5).

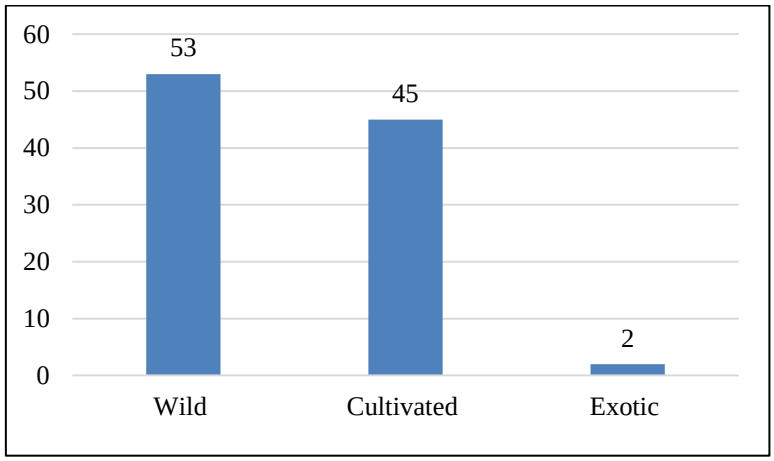

Fig. 5. Use of herbal plants according to the type of plant in Bousâada

The Use-Value (UV)

Regarding the use value of the reported species shown in Table 1, we found that *Citrus lemon* (L.) Burm. f., *Ficus carica* L., *Moringa oleifera* Lam. and *Olea europaea* L., were the most frequently used by the local population with the highest UV of 5. In the second position, we found three species with UV of 4, such as *Acanthus mollis* L., *Borrago officinalis* L., *Brassica oleracea var. capitata*, *Buxus sempervirens* L., *Corchorus olitorius* L., *Diospyros kaki* Thunb., *Iris germanica* L., *Narcissus tazetta* L., and *Senegalia senegal* (L.). The High ULs indicate that the local population uses the plant for many purposes to treat various disease categories Barnert and Messmann (2008). The lowest use value was observed in 43 species at a rate UV of one.

Table 1. List of medicinal plants from Bousâada and its environs traditionally used by the local population *herba*.

Species	Family	Common name in English	TP	NDC	N	UV	Np	FL%	Therapeutic use
Acanthus mollis L.	Acanthaceae	Acanthe molle	Herbs	4	1	4	1	5.26% 15.79% 31.58% 47.37%	- Skin diseases - Cardiovascular disorders - Gastrointestinal disorders - Other diseases
Actinidia deliciosa (A. Chev.) C.F. Liang & A.R. Ferguson	Actinidiaceae	Kiwi	Liana	2	1	2	1	25% 75%	- Cardiovascular disorders - Other diseases
Ajuga iva L.	Lamiaceae	Ivory	Herbs	2	2	1	1	100%	- Diseases of the glands attached to the digestive system
Alchemilla vulgaris L.	Rosaceae	Alchémille	Herbs	2	1	2	1	33.33% 66.67%	- Gastrointestinal disorders - Other diseases.
Alchemilla vulgaris L.	Rosaceae	Alchémille commune	Herbs	1	1	1	1	100%	- Urinary and reproductive system disorders
Allium ampeloprasum L.	Liliaceae	Poireau sauvage	Herbs	2	1	2	1	18.18% 81.82%	- Respiratory diseases - Other diseases
Allium cepa L.	Liliaceae	Oignon	Herbs	1	1	1	1	100%	- Other diseases
Allium sativum L.	Amaryllidaceae	Garlic	Bulbs	10	7	1.42	6	100%	- Diseases of the glands attached to the digestive system
Anacyclus pyrethrum (L.) Link	Asteraceae	Pyréthre d'Afrique	Perennial	2	1	2	1	18.18% 81.82%	- Respiratory diseases - Other diseases
Anastatica hierochuntica L.	Brassicaceae	Rose de Jéricho	Herbs	4	2	2	1	18.18% 81.82%	- Respiratory diseases - Other diseases
Anemone coronaria L.	Ranunculaceae	Anémone couronaire	Herbs	2	1	2	1	18.18% 81.82%	- Other diseases - Respiratory diseases
Angelica archangelica L.	Apiaceae	Angélique vraie	Herbs	1	1	1	1	100%	- Neurological disorders
Anthyllis vulneraria L.	Fabaceae	Violette des haies	Herbs	4	3	1.33	3	100%	- Skin diseases
Anvillea garcinii subsp. *radiata* (Coss. & Durieu) Anderb.	Asteraceae	Anvillea	Bushy undergrowth	8	6	1.33	5	100%	- Other diseases
Apium graveolens L.	Apiaceae	Céleri	Herbs	4	3	1.33	3	100%	- Gastrointestinal disorders
Aquilaria malaccensis Lam.	Thymelaeaceae	Garou de malacca	Tree	3	3	1	1	100%	- Other diseases
Arachis hypogaea L.	Fabaceae	Cacahuète	Herbs	6	4	1.5	3	100%	- Bone and joint pain
Artemisia dracunculus L.	Asteraceae	Estargon	Perennial herb	3	1	3	1	16.67% 33.33% 50%	- Cardiovascular disorders - Gastrointestinal disorders - Other diseases
Artemisia herba-alba Asso.	Asteraceae	Sagebrush	Perennial	45	22	2.04	15	100%	- Gastrointestinal disorders
Artemisia vulgaris L.	Asteraceae	Armoise commune / Armoise citronelle	Peranial	23	14	1.64	9	100%	- Gastrointestinal disorders
Artiplex halimus L.	Amarantaceae	Atriplex	Shrub	2	1	2	1	25% 75%	- Cardiovascular disorders - Gastrointestinal disorders
Arum creticum Boiss. et Heldr.	Araceae	Arum	Tuberous plant	3	1	3	1	11.76% 35.29% 52.94%	-Maladies respiratoires - Gastrointestinal disorders - Other diseases
Astragalus gummifer Labill.	Fabaceae	Tragacanthe	Shrub	1	1	1	1	100%	- Other diseases
Avena sativa L.	Poaceae	Avoine	Herbs	3	1	3	1	33.33% 66.67%	- Cardiovascular disorders - Other diseases
Beta vulgaris L.	Amaranthaceae	Épinard	Herbs	4	2	2	1	13.63% 18.18% 27.27% 40.91%	- Cardiovascular disorders - Urinary and reproductive system disorders - Gastrointestinal disorders - Other diseases
Beta vulgaris Subsp. *vulgaris* (autonyme).	Amaranthaceae	Betterave	Herbs	2	1	2	1	30.77% 69.23%	- Bone and joint pain - Other diseases
Borrago officinalis L.	Boraginaceae	Bourrache	Herbs	4	1	4	1	16.25% 12.5% 25% 56.25%	- Skin diseases - Respiratory diseases - Urinary and reproductive system disorders - Other diseases
Boswella sacra Flueck.	Burseraceae	Encens / résine oliban	Tree	2	1	2	1	10% 90%	- Skin diseases - Other diseases
Brassica oleracea var.*asparagoides* DC.	Brassicaceae	Brocli	Herbs	2	1	2	1	10% 90%	- Skin diseases - Other diseases

Brassica oleracea var.*capitata*	Brassicaceae	Chou pommé	Herbs	4	1	4	1	7.14% 14.28% 35.71% 42.86%	- Skin diseases - Respiratory diseases - Bone and joint pain - Gastrointestinal disorders
Bunium pachypodum P.W.Ball	Apiaceae	Bunium	Tree	2	1	2	1	43.75% 56.25%	- Diseases of the glands attached to the digestive system - Other diseases
Buxus sempervirens L.	Buxceae	Buis commun	Shrub	4	1	4	1	5.56% 16.67% 27.78%	- Skin diseases - Cardiovascular disorders - Bone and joint pain - Other diseases
Calendula officinalis L.	Asteraceae	Souci officinal	Herbs	7	5	1.4	5	100%	- Neurological disorders
Calluna vulgaris (L.) Hull	Ericaceae	Bruyère	Shrub	3	1	3	1	13.33% 26.67% 60%	- Respiratory diseases - Urinary and reproductive system disorders - Other diseases
Capparis spinosa L.	Capparaceae	Câprier commun	Shrub	2	1	2	1	35.71% 64.29%	- Bone and joint pain - Other diseases
Capsicum annuum L.	Solanaceae	Piment	Sub shrub	6	4	1.5	2	33.33% 66.67%	- Gastrointestinal disorders - Other diseases
Ceratonia siliqua L.	Fabaceae	Caroubier	Tree	2	2	1	1	100%	- Other diseases
Chrysanthemum pacificum Nakai.	Asteraceae	Chrysanthème Ajania	Perennial	1	1	1	1	100%	- Other diseases
Cichorium intybus L.	Asteraceae	Cichorée amère	Herbs	12	6	2	5	100%	- Urinary and reproductive system disorders
Cinnamomum verum J.Presl.	Lauraceae	Cannelle	Tree	1	1	1	1	100%	- Other diseases
Citrus lemon (L.) Burm. f.	Rutaceae	Citron	Tree	5	1	5	1	8.69% 13.63% 18.18% 22.73% 40.91%	- Respiratory diseases - Cardiovascular disorders - Urinary and reproductive system disorders - Bone and joint pain - Other diseases
Citrus sinesis (L.) Osbeck	Rutaceae	Orange	Shrub	13	7	1.857	5	100%	- Gastrointestinal disorders
Cocos nucifera L.	Arecaceae	Cocotier	Tree	2	1	2	1	33.33% 66.67%	- Respiratory diseases - Urinary and reproductive system disorders
Coffea arabica L.	Rubiaceae	Cafier	Shrub	5	3	1.66	3	100%	- Cardiovascular disorders
Commiphora myrrha (Nees) Engl.	Burseraceae	Arbe a myrrhe	Tree	4	4	1	2	100%	- Gastrointestinal disorders
Corchorus olitorius L.	Malvaceae	Corète potagère	Shrub	4	1	4	1	13.04% 21.74% 26.09% 39.14%	- Cardiovascular disorders -Bone and joint pain - Gastrointestinal disorders - Other diseases
Coriandrum sativum L.	Apiaceae	Coriandre cultivé	Herbs	5	4	1.25	3	100%	- Gastrointestinal disorders
Crataegus azarolus L.	Rosaceae	Aubépine	Tree	3	1	3	1	16.67% 25% 56.25%	- Cardiovascular disorders - Urinary and reproductive system disorders - Other diseases
Crocus sativus L.	Iridaceae	Safran	Herbs	6	4	1.5	3	100%	- Neurological disorders
Cucumis sativus L.	Cucurbitaceae	Concombre	Vegetable plant	5	2	2.5	3	33.33% 66.67%	- Cardiovascular disorders - Gastrointestinal disorders
Cucurbita maxima L.	Cucurbitaceae	Citrouille	Herbs	8	3	2.66	3	33.33% 66.67%	- Cardiovascular disorders - Gastrointestinal disorders
Cucurbita pepo L.	Cucurbitaceae	Courge d'été	Herbs	4	3	1.33	1	35.71% 64.29%	- Bone and joint pain - Other diseases
Cuminum cyminum L.	Apiaceae	Cumin	Herbs	6	4	1.5	3	100%	- Gastrointestinal disorders
Curcuma longa L.	Zingiberaceae	Curcuma	Herbs	5	3	1.66	2	100%	- Gastrointestinal disorders
Cutrullus colocynthis (L.) Schrad.	Cucurbitaceae	Coloquinte vraie	Perannial	3	2	1.5	2	100%	- Gastrointestinal disorders
Cynara cardunculus var.*scolymus* L.	Asteraceae	Artichaut cultivé	Herbs	3	1	3	1	16.25% 37.5% 56.25%	- Skin diseases - Gastrointestinal disorders - Other diseases
Cynodon dactylon (L.)Pers.	Poaceae	Chiendent	Herbs	2	1	2	1	30.77% 69.23%	- Urinary and reproductive system disorders - Other diseases
Cyperus diffusus L.	Cyperaceae	Suchet galingale	Herbs	1	1	1	1	100%	- Other diseases
Cyperus esculentus L.	Cupressaceae	Hab el-aziz	Herbs	4	4	1	4	100%	- Other diseases
Daucus carota L.	Apiaceae	Carotte	Herbs	4	2	2	2	33.33% 66.67%	- Gastrointestinal disorders - Other diseases
Diospyros kaki Thunb.	Ebenaceae	Plaqueminier du	Tree	4	1	4	1	13.64%	- Cardiovascular disorders

		japon						18.18% 27.27% 40.91%	- Urinary and reproductive system disorders - Gastrointestinal disorders - Other diseases
Dipsacus fullonum L.	Dipsacaceae	Cardère	Herbs	3	1	3	1	6.25% 37.5% 56.25%	- Skin diseases - Gastrointestinal disorders - Other diseases
Dittrichia viscosa (L.) Greuter	Asteraceae	Inule visqueuse	Perennial	2	1	2	1	18.18% 82.82%	- Respiratory diseases - Other diseases
Dorema ammoniacum D. Don	Apiaceae	Doréma	Tree	2	1	2	1	33.33% 66.67%	- Gastrointestinal disorders - Other diseases
Dorsera spatulata Labill.	Droseraceae	Droséra	Carnivoro us plant	2	1	2	1	9.52% 23.81% 38.09% 28.57%	- Respiratory diseases - Bone and joint pain - Neurological disorders - Gastrointestinal disorders
Dracaena cinnabari Balf.f.	Asparagaceae	Dragonnier de socotra	Tree	2	1	2	1	35.71% 64.29%	- Bone and joint pain - Other diseases
Dryas integrifolia Vall.	Rosaceae	Dryade	Shrub	7	6	1.16	4	100%	- Bone and joint pain
Ecballium elaterium (L.) A. Rich.	Cucurbitaceae	Concombre d'ane	Herbs	3	1	3	1	12.5% 31.25% 56.25%	- Respiratory diseases - Bone and joint pain - Other diseases
Elettaria cardamomum (L.) Maton	Zingiberaceae	Cardamome	Perennial	1	1	1	1	100%	- Other diseases
Equisetum arvense L.	Equisetaceae	Prêle des champs	Herbs	3	1	3	1	18.75% 25% 56.25%	- Cardiovascular disorders - Urinary and reproductive system disorders - Other diseases
Eruca sativa Mill.	Brassicaceae	Roquette	Herbs	4	3	1.33	1	33.33% 66.67%	- Gastrointestinal disorders - Other diseases
Erygium campestre L.	Apiaceae	Chardon roland panicaut	Perennial	2	1	2	1	30.77% 69.23%	- Urinary and reproductive system disorders - Other diseases
Eucalyptus globulus Labill.	Myrtaceae	Eucalyptus	Tree	5	3	1.66	3	100%	- Respiratory diseases
Ferula assa-foetida L.	Apiaceae	Ase fétide	Herbs	4	3	1.33	2	40% 60%	- Urinary and reproductive system disorders - Gastrointestinal disorders
Ficus carica L.	Moraceae	Figuier	Tree	5	1	5	1	4.17% 12.5% 20.83% 25% 37.5%	- Skin diseases - Cardiovascular disorders - Bone and joint pain - Gastrointestinal disorders - Other diseases
Ficus religiosa L.	Moraceae	Figuier des pagodes	Tree	2	1	2	1	33.33% 66.67%	- Gastrointestinal disorders - Other diseases
Foeniculum vulgare var. *dulce* (Mill.) Batt.	Apiaceae	Fenouil doux	Perennial	1	1	1	1	100%	- Other diseases
Foeniculum vulgare Mill.	Apiaceae	Fenouil sauvage	Shrub	2	2	1	1	13.33% 40% 46.67%	- Respiratory diseases - Gastrointestinal disorders - Diseases of the glands attached to the digestive system
Fraxinus excelsior L.	Oleaceae	Frêne	Tree	3	1	3	1	18.75% 25% 56.25%	- Cardiovascular disorders - Urinary and reproductive system disorders - Other diseases
Fumaria officinalis L.	Papaveraceae	Fumeterre officinale	Herbs	4	2	2	2	100%	- Urinary and reproductive system disorders
Globularia alypum L.	Globulariaceae	Globulaire	Sub-shrub	3	1	3	1	26.66% 33.33% 40%	- Urinary and reproductive system disorders - Bone and joint pain - Gastrointestinal disorders
Glycine max (L.) Merr.	Fabaceae	Soja	Herbs	7	4	1.75	3	100%	- Other diseases
Glycyrrhiza glabra L.	Fabaceae	Réglisse	Perennial	9	4	2.25	2	15.38% 30.77% 53.85%	- Respiratory diseases - Urinary and reproductive system disorders - Diseases of the glands attached to the digestive system
Hammda scoparia (Pomel) Iljin	Amaranthaceae	Remth	Schrub	4	4	1	1	100%	- Gastrointestinal disorders
Harpagophytum procumben L.	Pedaleaceae	Harpagophytn	Herbs	2	1	2	1	35.71% 64.29%	- Bone and joint pain - Other diseases
Helianthus annuus L.	Asteraceae	Tournesol	Herbs	9	6	1.5	3	100%	- Cardiovascular disorders
Hibiscus sabdariffa L.	Malvaceae	Oseille de guinée	Herbs	2	2	1	1	25%	- Cardiovascular disorders

								75%	- Other diseases
Hordeum vulgare L.	Poaceae	Orge	Herbs	4	2	2	2	46.15%	- Gastrointestinal disorders
								53.85%	- Diseases of the glands attached to the digestive system
Humulus lupulus L.	Cannabaceae	Houblon	Herbs	2	1	2	1	47.06%	- Neurological disorders
								52.94%	- Other diseases
Hyssopus officinalis L.	Lamiaceae	Hyssopus	Shrub	3	1	3	1	16.67%	- Respiratory diseases
								33.33%	- Urinary and reproductive system disorders
								50%	- Gastrointestinal disorders
Iris germanica L.	Iridaceae	Iris	Perennial	4	1	4	1	11.11%	- Respiratory diseases
								16.67%	- Cardiovascular disorders
								22.22%	- Urinary and reproductive system disorders
								50%	- Other diseases
Jasminum polyanthum Franch.	Oleaceae	Jasmin	Shrub	3	1	3	1	6.67%	- Skin diseases
								33.33%	- Bone and joint pain
								60%	- Other diseases
Juglans regia L.	Juglandaceae	Noix	Tree	1	1	1	1	100%	- Other diseases
Juniperus communis L.	Cupressaceae	Genévrier	Tree	36	20	1.8	20	100%	- Gastrointestinal disorders
Juniperus phoenicia L.	Cupressaceae	Genévrier de phénicie	Shrub	1	1	1	1	100%	- Gastrointestinal disorders
Laurus nobilis L.	Lauraceae	Laurier	Shrub	5	4	1.25	3	100%	- Gastrointestinal disorders
Lavandula angustifolia Mill.	Lamiaceae	Lavande	Sub-Shrub	2	1	2	1	42.86%	- Gastrointestinal disorders
								57.14%	- Troubles neurologiques
Lavandula officinalis L.	Lamiaceae	Lavande officinale	Sub-Shrub	4	2	2	1	16.67%	- Urinary and reproductive system disorders
								20.83%	
								25%	- Bone and joint pain
								37.5%	- Gastrointestinal disorders
									- Other diseases
Lawsonia inermis L.	Lythraceae	Henné	Shrub	2	1	2	1	10%	- Skin diseases
								90%	- Other diseases
Lellium temulentum L.	Poaceae	Ivraie enivrante	Herbs	2	1	2	1	30.77%	- Urinary and reproductive system disorders
								69.23%	- Other diseases
Lens culinaris Medick.	Fabaceae	Lentille	Herbs	6	3	2	3	100%	-Bone and joint pain
Lepidium sativum L.	Brassicaceae	Cresson alénois	Herbs	8	6	1.33	5	100%	- Skin diseases
Linum usitatissimum L.	Linaceae	Lin cultivé	Herbs	1	1	1	1	100%	- Other diseases
Lisimachia arvensis (L.) U.Manns & Anderb.	Primulaceae	Mouron	Herbs	3	1	3	1	5.56%	- Skin diseases
								44.44%	- Neurological disorders
								50%	- Other diseases
Lupinus luteus L.	Fabaceae	Lupin	Herbs	1	1	1	1	100%	- Other diseases
Lycium afrum L.	Solanaceae	Lyciet	Shrub	2	1	2	1	40%	- Gastrointestinal disorders
								60%	- Other diseases
Lytrum salicaria L.	Lythraceae	Salicaire commune	Herbs	5	3	1.66	3	18.75%	- Cardiovascular disorders
								25%	- Urinary and reproductive system disorders
								56.25%	- Other diseases
Malus domestica Borkh.	Rosaceae	Pommier	Tree	2	2	1	2	100%	- Other diseases
Malva parviflora L.	Malvaceae	Mauve	Herbs	12	10	1.2	1	40%	- Gastrointestinal disorders
								60%	- Other diseases
Marrubium vulgar L.	Lamiaceae	Marrube blanc	Herbs	15	7	2.14	5	100%	- Diseases of the glands attached to the digestive system
Matricaria discoidea DC.	Asteraceae	Matricaire	Herbs	2	2	1	1	10%	- Skin diseases
								90%	- Other diseases
Melissa officinalis L.	Lamiaceae	Verveine	Herbs	14	11	1.27	6	100%	- Other diseases
Mentha viridis L.	Lamiaceae	Green mint	Perenial	48	18	2.66	13	100%	- Gastrointestinal disorders
Moringa oleifera Lam.	Moringaceae	Moringa	Shrub	5	1	5	1	11.54%	- Cardiovascular disorders
								15.38%	- Urinary and reproductive system disorders
								19.23%	
								23.08%	- Douleurs osseuses et articulaires
								30.77%	- Gastrointestinal disorders
									-Troubles neurologiques
Morus alba L.	Moraceae	Murier	Shrub	2	1	2	1	43.75%	- Diseases of the glands attached to the digestive system
								56.25%	- Others
Musa paradiciaca L.	Musaceae	Banane	Shrub	4	2	2	1	10%	- Skin diseases
								90%	- Other diseases

Mycota alexop L.	Pleurotaceae	Champignon	Mushroom	1	1	1	1	100%	- Respiratory diseases
Narcissus tazetta L.	Amaryllidaceae	Narcisse à bouquet	Herbs	4	1	4	1	5.88% 11.76% 29.41% 52.94%	- Skin diseases - Respiratory diseases - Bone and joint pain - Other diseases
Nerium oleander L.	Apocynaceae	Laurier rose	Schrub	1	1	1	1	100%	- Skin diseases
Nigella sativa L.	Ranunculaceae	Nigelle	Herbs	7	6	1.16	4	100%	- Gastrointestinal disorders
Ocimum basilicum L.	Lamiaceae	Basilic	Herbs	5	3	1.66	3	100%	- Gastrointestinal disorders
Olea europaea L.	Oleaceae	Olivier	Tree	5	1	5	1	4% 8% 24% 28% 36%	- Skin diseases - Respiratory diseases - Gastrointestinal disorders - Diseases of the glands attached to the digestive system - Other diseases
Opuntia ficus-indica (L.) Mill.	Cactaceae	*Cactus raquettes*	Shrub	4	4	1	3	100%	- Other diseases
Origanum majorana L.	Lamiaceae	Origan marjolaine	Perennial	2	2	1	1	100%	- Other diseases
Panax ginsengs C.A. Mey.	Araliaceae	Panax	Perennial	1	1	1	1	100%	- Other diseases
Panicum virgatum L.	Poaceae	Millet vivace	Perennial	2	1	2	1	35.71% 64.28%	- Bone and joint pain - Other diseases
Peganum harmala L.	Nitrariaceae	Harmel	Peranial	8	6	1.33	6	100%	- Bone and joint pain
Petroselinum crispum (Mill.) Fuss	Apiaceae	Persil	Herbs	5	4	1.25	2	33.33% 66.67%	- Cardiovascular disorders - Gastrointestinal disorders
Phoenix dactylifera L.	Arecaceae	Palm	Tree	3	1	3	1	11.11% 5.56% 33.33% 50%	- Respiratory diseases - Skin diseases - Gastrointestinal disorders - Other diseases
Phylanthus emblica L.	Phyllanthaceae	Amla	Tree	1	1	1	1	100%	- Skin diseases
Pimpinella anisum L.	Apiaceae	Anis	Herbs	7	6	1.16	5	100%	- Gastrointestinal disorders
Pinus halpensis Mill.	Pinaceae	Pin d'Alep	Tree	7	6	1.16	6	100%	- Gastrointestinal disorders
Pinus krempfii Lecomte.	Pinaceae	Tannage	Tree	2	1	2	1	10% 90%	- Skin diseases - Other diseases
Pistacia lentiscus L.	Anacardiaceae	Lentisque	Schrub	3	2	1.5	1	6.25% 37.5% 56.25%	- Skin diseases – Gastrointestinal disorders - Other diseases
Pistacia lentiscus L.	Anacardiaceae	Arbre de mastic/ Pistachier lentisque	Shrub	1	1	1	2	25% 75%	- Cardiovascular disorders - Other diseases
Plantago ovata Forssk.	Plantaginaceae	Psyllium blond	Herbs	5	2	2.5	1	16.67% 33.33% 50%	- Cardiovascular disorders - Gastrointestinal disorders - Other diseases
Plantago ovata Forssk.	Plantaginaceae	Psyllium blond	Herbs	2	1	2	1	40% 60%	- Gastrointestinal disorders - Other diseases
Portulaca oleracea L.	Portulaceae	Pourpier maraîcher	Herbs	2	1	2	1	40% 60%	- Gastrointestinal disorders - Other diseases
Prunus armeniaca L.	Rosaceae	Abricotier	Tree	2	1	2	1	30.77% 69.23%	- Urinary and reproductive system disorders - Other diseases
Prunus cerasus L.	Rosaceae	Cerise	Tree	2	1	2	1	47.06% 52.94%	- Neurological disorders - Other diseases
Prunus dulcis (Mill.) D.A.Webb.	Rosaceae	Amandier	Tree	2	1	2	1	25% 75%	- Cardiovascular disorders - Other diseases
Prunus persica (L.) Batsch	Rosaceae	Pêcher	Tree	1	1	1	1	100%	- Other diseases
Psidium guajava L.	Mytraceae	Goyavier	Schrub	2	1	2	1	10% 90%	- Skin diseases - Other diseases
Punica granatum L.	Lythraceae	Grenadier	Tree	14	6	2.33	5	14.29% 85.71%	- Skin diseases - Gastrointestinal disorders
Quercus ilex L.	Fagaceae	Chêne vert	Tree	1	1	1	1	100%	- Gastrointestinal disorders
Retama raetam (Forssk.) Webb & Berthel.	Fabaceae	Retam	Shrub	1	1	1	1	100%	- Urinary and reproductive system disorders
Rhamus alternus L.	Rhamnaceae	Nerprun alaterne	Shrub	1	1	1	1	100%	- Other diseases
Rhus typhina L.	Anacardiaceae	Sumac vinaigrier	Tree	2	1	2	1	10% 90%	- Skin diseases - Other diseases
Ricinus communis L.	Euphorbiaceae	Ricin	Shrub	1	1	1	1	100%	- Other diseases
Rosa canina L.	Rosaceae	Eglantier	Herbs	2	1	2	1	10% 90%	- Skin diseases - Other diseases
Rosa damascena Mill.	Rosaceae	Rose	Shrub	4	2	2	1	9.52% 23.81%	- Respiratory diseases - Bone and joint pain

								28.57%	- Gastrointestinal disorders
								38.10%	- Neurological disorders
Rosmarinus officinalis L.	Lamiaceae	Romarin	Subshrub	13	8	1.62	3	100%	- Cardiovascular disorders
Rubia tinctorum L.	Rubiaceae	Rubia	Shrub	2	1	2	1	40%	- Gastrointestinal disorders
								60%	- Other diseases
Ruta montana L.	Rutaceae	Rue de Chalep	Herbs	12	6	2	6	100%	- Gastrointestinal disorders : Emménagogue, antispasmodique et rubéfiant
Saguisorba officinalis L.	Rosaceae	Sanguisorbe officinale	Perennial	9	5	1.8	3	100%	- Skin diseases
Salvadora persica L.	Salvadoraceae	Souek / Bois d'Araq	Schrub	1	1	1	1	100%	- Other diseases
Salvia hispanica L.	Lamiaceae	Graine de chia	Herbs	2	1	2	1	34.71%	- Bone and joint pain
								64.29%	- Other diseases
Salvia officinalis L.	Lamiaceae	Sauge	Sub-Schrub	3	1	3	1	6.25%	- Skin diseases
								12.5%	- Respiratory diseases
								25%	- Urinary and reproductive system disorders
								56.25%	-Other diseases
Salvia rosmarinus L.	Lamiaceae	Romarin	Schrub	13	8	1.62	3	100%	- Cardiovascular disorders
Saussurea costus (Falc.) Lipsch.	Asteraceae	Costus	Herbs	3	1	3	1	15.38%	- Respiratory diseases
								23.08%	- Gastrointestinal disorders
								26.92%	- Diseases of the glands attached to the digestive system
								34.62%	
Senegalia senegal (L.) Britton	Fabaceae	Gomme arabique	Tree	4	1	4	1	5.56%	- Skin diseases
								11.11%	-Respiratory dideases
								33.33%	- Gastrointestinal disorders
								50%	- Other diseases
Senna alexandrina Mill.	Fabaceae	Séné alexandrin	Small shrub	6	3	2	3	100%	- Other diseases
Sesamum indicum L.	Pedaliaceae	Sésame	Herbs	5	3	1.66	1	100%	- Other diseases
Silbym marianum (L.) Gaertn.	Asteraceae	Chardon-Marie	Herbs	2	1	2	1	30.77%	- Urinary and reproductive system disorders
								69.23%	- Other diseases
Sinapis arvensis L.	Brassicaceae	Moutarde	Shrub	1	1	1	1	100%	- Other diseases
Solanum lycopersicum L.	Solanaceae	Tomate	Herbs	7	5	1.4	4	100%	- Other diseases
Solanum melongena L.	Solanaceae	Aubergine	Herbs	3	1	3	1	16.67%	- Cardiovascular disorders
								33.33%	- Gastrointestinal disorders
								50%	- Other diseases.
Spergularia rubra J.Presl & C.Presl	Caryophylacées	Sabline rouge	Herbs	2	1	2	1	10%	- Skin diseases
								90%	- Other diseases
Stipa tenacissima L.	Poaceae	Stipe	Perannial	1	1	1	1	43.75%	- Diseases of the glands attached to the digestive system
								56.25%	- Other diseases
Syzygium aromaticum (L.) Merr. & L.M.Perr	Myrtaceae	Girofle	Herbs	5	2	2.5	2	100%	- Respiratory diseases
Tamarindus indica L.	Fabaceae	Tamarinier	Tree	3	1	3	1	28.57%	- Gastrointestinal disorders
								33.33%	- Diseases of the glands attached to the digestive system
								38.10%	- Neurological disorders
Tebebuia avelleneda Gomes ex DC.	Bignoniaceae	Lapacho	Tree	2	1	2	1	10%	- Skin diseases
								90%	- Other diseases
Terfezia arenaria (Moris) Trappe	Pezizaceae	Truffes	Mushroom	1	1	1	1	100%	- Urinary and reproductive system disorders
Tetraclinis articulata (Vahl) Mast	Cupressaceae	Thuya de Berbérie	Tree	2	1	2	1	18.18%	- Respiratory diseases
								81.82%	- Other diseases
Teucrium polium L.	Lamiaceae	La germandrée tomenteuse	Herbs	14	8	1.75	5	14.29%	- Skin diseases
								85.71%	- Gastrointestinal disorders
Theobroma cacao L.	Malvaceae	Cacao	Small tree	2	1	2	1	25%	- Cardiovascular disorders
								75%	- Other diseases
Thuja occidentalis L.	Cupressaceae	Thuya	Tree	2	1	2	1	40%	- Gastrointestinal disorders
								60%	- Other diseases
Thymelaea hirsuta (L.) Endl.	Thymelaeaceae	Passerine hérissée	Shrub	6	4	1.5	4	100%	- Other diseases
Thymus serpyllum L.	Lamiaceae	Thyme	Sub-shrub	15	9	1.66	8	100%	- Cardiovascular disorders
Thymus vulgaris L.	Lamiaceae	Thyme	Sub-shrub	28	15	1.86	12	100%	- Respiratory diseases
Tirmania nivea (Desf.) Trappe	Pezizaceae	Terfesse	Mushroom	4	2	2	1	43.75%	Diseases of the glands attached to the digestive

								56.25%	system - Other diseases
Trigonella foenum-graecum L.	Fabaceae	Fenugrec	Herbs	11	8	1.375	5	100%	- Neurological disorders
Triticum aestivum L.	Poaceae	Son de blé	Herbs	2	2	1	1	100%	- Gastrointestinal disorders
Triticum durum Desf.	Poaceae	Blé	Herbs	2	1	2	1	40% 60%	- Gastrointestinal disorders - Other diseases
Tritium vulgare L.	Poaceae	Blé	Herbs	12	4	3	3	100%	- Urinary and reproductive system disorders
Urtica dioica L.	Urticaceae	Ortie	Perennial	2	1	2	1	100%	- Urinary and reproductive system disorders
Vachellia nilotica **(**L.)	Fabaceae	Gommier rouge	Shrub	2	1	2	1	100%	- Gastrointestinal disorders
Valeriana officinalis L.	Valerianaceae	Valériane officinale	Herbs	1	1	1	1	100%	- Neurological disorders
Vinca minor L.	Apocynaceae	Pervenche	Perennial	5	3	1.66	2	18.75% 25% 56.25%	- Cardiovascular disorders - Urinary and reproductive system disorders - Other diseases
Viola odorata L.	Violaceae	Violettes	Pernnial	2	1	2	1	10% 90%	- Skin diseases - Other diseases
Vitex agnus-castus L.	Verbenaceae	Gattilier	Shrub	1	1	1	1	100%	- Other diseases
Vitis vinifera L.	Vitaceae	Raisin	Herbs	3	3	1	1	100%	- Other diseases
Zea mays L.	Poaceae	Maïs	Herbs	6	5	1.2	3	30.77% 69.23%	- Urinary and reproductive system disorders - Others
Zingiber officinale Roscoe	Zingiberaceae	Gingembre	Herbs	4	2	2	2	100%	- Respiratory diseases
Ziziphus lotus L.	Rhamnaceae	Jujubier	Tree	6	2	3	2	100%	- Other diseases

N: Total number of usage reports cited for a given species; **NDC**: Number of disease categories;**VU**: Use Value; **Np**: Number of use reports cited for a given species for a particular disease category; **BT**: Biological type

Fidelity level (FL)

The fidelity level (FL) of the species is ranged between 4% and 100% (Table 1). The highest value of FL (100%) was reported for 73 species, including 27 species that were used to treat other diseases (viz. *Allium cepa* L., *Anvillea garcinii* subsp. *radiata* (Coss. and Durieu) Anderb., *Aquilaria malaccensis* Lam., *Astragalus gummifer* Labill., *Ceratonia siliqua* L., *Chrysanthemum pacificum* Nakai., *Cinnamomum verum* J. Presl., *Cyperus diffusus* L., *Cyperus esculentus* L., *Elettaria cardamomum* (L.) Maton, *Foeniculum vulgare* var. *dulce* (Mill.) Batt., *Linum usitatissimum* L., *Melissa officinalis* L., *Opuntia ficus-indica* (L.) Mill., *Origanum majorana* L., *Panax ginsengs* C.A. Mey., *Prunus persica* (L.) Batsch, *Rhamus alternus* L., *Salvadora persica* L., *Senna alexandrina* Mill., *Sesamum indicum* L., *Sinapis arvensis* L., *Solanum lycopersicum* L., *Thymelaea hirsute* (L.) Endl., *Vitex agnus-castus* L., *Vitis vinifera* L., *Ziziphus lotus* L.) and 21 species were used to treat gastro-intestinal diseases (viz. *Apium graveolens* L., *Artemisia herba-alba* Asso., *Artemisia vulgaris* L., *Citrus sinesis* (L.) Osbeck, *Commiphora myrrha* (Nees) Engl., *Cuminum cyminum* L., *Curcuma longa* L., *Cutrullus colocynthis* (L.) Schrad., *Hammda scoparia* (Pomel) Iljin, *Juniperus communis* L., *Juniperus phoenicia* L., *Laurus nobilis* L., *Mentha viridis* L., *Nigella sativa* L., *Ocimum basilicum* L., *Pimpinella anisum* L., *Pinus halpensis* Mill., *Quercus ilex* L., *Ruta montana* L., *Triticum aestivum* L., *Vachellia nilotica* (L.). These results obtained were not highest with other studies scored 100% of FL in Algeria, such as Souilah *et al.* (2018) in the National Park of El Kala citing 38 species, Benarba *et al*. (2015) in Mascara mentioning 7 species and Ouelbani *et al*. (2016) in Constantine and Mila found only one species. Some plants are also indicated to be used for gastro-intestinal diseases, such as *Ajuga iva* (L.) Schreb., *Globularia alypum* L., *Juglans regia* L., *Opuntia ficus-indica* L., and *Trigonella foenum-graecum* L. reported by Miara *et al.* (2013), Moussaoui *et al.* (2014), Chermat and Gharzouli (2015), Meddour and Meddour-Sahar (2015), and Bendif *et al.* (2017), respectively. Generally, the highest level of fidelity is obtained from the species almost all the local population uses it to treat the same diseases. The lowest value of FL (4%) is obtained in the

species of *Olea europaea* L. and this low value shows that this species is used to treat many different diseases.

Informant Consensus Factor (ICF)

The Table 2 shows the values of informant consensus factor (ICF) calculated for 10 ailments categories. The ICF values ranged from 0.33 to 0.6. The category of diseases related to gastrointestinal disorders and diseases of the glands attached to the digestive system diseases shows the highest values (0.6) with 6 species such as, *Juniperus* L., *Artimisia herba halba* L., *Mentha viridis* L., *Artimisia campestris* L., *Pinus halpensis*, *Malva parviflora* L., and 5 species mostely used like: *Juniperus communis* L., *Mentha viridis* L., *Marrubium vulgar* L., *Thymus vulgaris* L. and *Artimisia herba halba* L. Neurological diseases scored an ICF value of 0.5 with four species (viz. *Mentha viridis* L., *Trigonella foenum-graecum* L., *Calendula officinalis* L. and *Melissa officinalis* L.) followed by the plants used for the treatment of kidney and reproductive system disorders (0.47) with 4 species, respiratory diseases (0.42) with 2 species, and other diseases (0.39) with 10 species, bone and joint pain (0.37) with 2 species, and dermatological disorders (0.33) with two species.

Table 2. Informant Consensus Factor (ICF) for different disease categories.

Categories of diseases	Nur	Nt	ICF	Most used species	Nbr of species
Dermatological disorders	72	48	0.33	*Teucrium polium* L.	5
				Punica granatum L.	5
Respiratory diseases	69	40	0.42	*Thymus vulgaris* L.	12
				Artimisia herba halba L.	7
Kidney and reproductive system disorders	88	47	0.47	*Thymus serpyllum* L.	8
				Artimisia herba halba L.	7
				Allium sativum L.	6
				Mentha viridis L.	5
Cardiovascular diseases	64	48	0.25	*Cichorium intybus* L.	5
Bone and joint pain	62	39	0.37	*Peganum harmala* L.	6
				Lepidium sativum L.	5
Gastrointestinal diseases	202	81	0.6	*Juniperus communis* L.	20
				Artimisia herba halba L.	15
				Mentha viridis L.	13
				Artimisia campestris L.	9
				Pinus halpensis Mill.	6
				Malva parviflora L.	6
Diseases of the glands attached to the digestive system	56	23	0.6	*Juniperus phoenicia* L.	9
				Mentha viridis L.	6
				Marrubium vulgar L.	5
				Thymus vulgaris L.	4
				Artimisia herba halba L.	4
Neurological diseases	41	21	0.5	*Mentha viridis* L.	8
				Trigonella foenum-graecum L.	5
				Calendula officinalis L.	5
				Melissa officinalis L.	4
Other diseases	272	165	0.39	*Thymus vulgaris* L.	10
				Artimisia herba halba L.	9
				Mentha viridis L.	7
				Malva parviflora L.	6
				Melissa officinalis L.	6
				Artimisia campestris L.	5
				Anvillea gravinii L.	5
				Thymus serpyllum L.	5
				Marrubium vulgar L.	4
				Allium sativum L.	4
				Thymelaea, mill. hirsita L.	4

The IFC for plants used against cardiovascular diseases (0.25) was low compared to other categories of diseases. Thes results obtained are similar to other authors in Algeria (Benarba *et al.* 2015, Bendif *et al.* 2017, Souilah *et al.* 2018), Morocco (El-Hilaly *et al.* 2003), Tunisia (Leporatti and Ghedira 2009), Italy (Cas *et al.* 2015, Tuttolomondo *et al.* 2014) and Spain (Benítez *et al.* 2010) who showed that the gastro-intestinal disorders were the highest ICF.

Boussaâda district of M'sila province is a rich area for medicinal plant species diversity associated with the local knowledge of ethno-medicinal uses. The study resulted the inventory of the medicinal species and collecting as much information as possible on the traditional therapeutic uses. In total 193 species belonging to 69 families used in traditional medical practices were identified. The most commonly reported families were Lamiaceae (16 species), Fabaceae (14 species), Asteraceae (13 species), Apiaceae (12 species), Rosaceae (12 species), and Apiaceae (10 species). The mostly used plants by the local population as herbal medicine are *Artemisia herba-alba*, *Juniperus oxycedrus*, *Mentha viridis*, *Thymus vulgaris* and *Artemisia vulgaris.* More than 50% of inventoried plants were available in the spring time. According to the habitat, spontaneous plants were the most important for the majority of the uses in traditional medicine (53%). The cultivated plants constitute 45%, while the exotic ones were least used (2%). The ethnobotanical study carried out on the study site highlighted the important place of traditional herbal medicine in the lifestyle of the inhabitants of Boussaâda. Data were analyzed using quantitative indices of socio-demographic data, species use value (UV), level of fidelity level (FL), and informant consensus factor (ICF). The highest UV was calculated for *Citrus lemon* (L.) Burm., *Ficus carica* L., *Moringa oleifera* Lam. and *Olea europaea* L. (UV=5). The highest FL value was recorded for 73 species. The ICF results revealed that diseases related to gastrointestinal disorders and diseases of the glands attached to the digestive system have the highest value.

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