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Taxonomy and ethnobotanical study of medicinal plants used by the local population of the Algerian highlands

[Estudio taxonómico y etnobotánico de plantas medicinales utilizadas por la población local de las tierras altas argelinas]

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Abstract: In this study, interviews were conducted with 313 informants from the Algerian highlands, including 47 traditional practitioners, 26 herbalists and 240 inhabitants over two successive years. These informants cited 121 species, classified into 108 genera and 49 botanical families. The most cited plant families were Asteraceae (14%) and Lamieaceae (13%), then Apiaceae (6.5%). *Thymus algeriensis* Bioss. & Reut. had the highest use and use value reports (UR=197, UV=0.82), followed by *Artemisia herba-alba* Asso (UR=191, UV=0.80) and *Eucalyptus camaldulensis* Dehnh. (UR=180, UV=0.70). The most cited plant species were *A. herba-alba* with citation frequency (CF) value, followed by *T. algeriensis* (CF=170) and *E. camaldulensis* (CF=155). The highest informant consensus factor (ICF) was for digestive system diseases (ICF=0.90), followed by respiratory system infections (ICF=0.87). This information would be very beneficial for researchers in pharmacology and modern medicine, as the discovery of new bioactive substances.

Keywords: Medicinal plants; Botanical families; Ethnobotanical study; Local population; Algeria

Resumen: En este estudio, se realizaron entrevistas a 313 informantes de las tierras altas argelinas, incluyendo 47 médicos tradicionales, 26 herbolarios y 240 habitantes durante dos años sucesivos. Estos informantes mencionaron 121 especies, clasificadas en 108 géneros y 49 familias botánicas. Las familias de plantas más citadas fueron Asteraceae (14%) y Lamiaceae (13%), seguidas por Apiaceae (6.5%). *Thymus algeriensis* Bioss. & Reut. tuvo el mayor número de informes de uso (UR) y valor de uso (UV) (UR=197, UV=0.82), seguido por *Artemisia herba-alba* Asso (UR=191, UV=0.80) y *Eucalyptus camaldulensis* Dehnh. (UR=180, UV=0.70). Las especies de plantas más mencionadas fueron *A. herba-alba* con un valor de frecuencia de mención (CF), seguida por *T. algeriensis* (CF=170) y *E. camaldulensis* (CF=155). El factor de consenso del informante más alto (ICF) fue para enfermedades del sistema digestivo (ICF=0.90), seguido por infecciones del sistema respiratorio (ICF=0.87). Esta información sería muy beneficiosa para los investigadores en farmacología y medicina moderna, ya que podría conducir al descubrimiento de nuevas sustancias bioactivas.

Palabras clave: Plantas medicinales; Familias botánicas; Estudio etnobotánico; Población local; Argelia.

INTRODUCTION

Currently, great importance is given to ethnobotanical studies to reveal the species of medicinal plants of importance to the local inhabitants of each region, and to document their knowledge and experiences in herbal medicine. In all ancient civilizations and on all continents, we find traces of the use of aromatic and medicinal plants. Thus, even today, despite progress in pharmacology, the therapeutic use of plants is very present in certain countries, particularly in developing countries (Hayta *et al*., 2014). Herbalists are so popular in Africa that an herb trading market in Durban is said to attract between 700,000 and 900,000 traders a year from South Africa, Zimbabwe, and Mozambique (Helwig, 2005). Today, doctors often work closely with healers (Babulka, 2007).

Traditional medicine constitutes a precious treasure to activate and enrich scientific research in the medical field. Plants used for centuries to relieve and cure illnesses certainly contain the active biomolecules sought by specialists in the preparation and manufacture of medicines. Recently, despite progress in pharmacology, and due to the lack of a modern medical system, the therapeutic use of medicinal plants is very widespread in developing countries (Tabuti *et al*., 2003). In fact, there are approximately 500,000 species of plants on earth, of which 80,000 have medicinal properties (Quyou, 2003). Traditional medicine is practiced by 80% of African populations (WHO, 2002). According to Sofowora (1993), the African continent is full of very diverse medicinal plants. Indeed, the tropical countries of Africa are home to more than 200,000 species out of the 300,000 plant species recorded on the planet (Sofowora, 1993). In developing countries and in the absence of a modern medicinal system, medicinal plants remain a source of medical care (Tabuti *et al*., 2003).

For centuries, medicinal and aromatic plants have been used by Algerian populations to treat several ailments (Reguieg, 2011). Algeria is considered one of the richest Arab countries in terms of plant diversity with 3,164 species of vascular plants (Vasisht & Kumar, 2004). This country is characterized by a flora rich in medicinal and aromatic plants, due to its climatic and topographical diversity (Azzi et *al*., 2012). The local residents of the Algerian steppe zones use traditional medicine primarily and sometimes exclusively, because it remains the most affordable, is not expensive and seems effective (Boukerker, 2016). Overall Algerian biodiversity (natural and agricultural) numbers around 16,000 species, but the Algerian economy only uses less than 1% of this total (Mediouni, 2000). Around 1,000 species have medicinal properties (60 other species are still unknown) (Beloued, 2001). Aromatic plants have been used since ancient times as well as in therapy in preserving and flavoring food, but only in the last decade scientific research has focused its interest on their essential oils and natural extracts as sources of antimicrobial compounds and antioxidants (Tenore *et al*., 2011; Marangoni & Moura, 2011; Özcan & Al Juhaimi, 2015).

In Algeria, several works have been carried out in the field of ethnobotany and ethnopharmacology. These ethnopharmacological surveys have been carried out recently in certain areas such as the central Sahara and the central part of the North and North-West of Algeria (Hammiche & Maiza, 2006; Boudjelal *et al*., 2013; Sarri *et al*., 2014; Benarba *et al*., 2015). These investigations are relevant to each other, but there is a great variation of information, method of preparation of medicinal plants, their Arabic nomination and their reports of use. This richness is due to the biological, ecological and cultural diversity which owns our country Algeria. As for languages, there are Arabic (official), French (lingua franca), Berber or Tamazight (official); dialects include Kabyle Berber (Taqbaylit), Shawiya Berber (Tacawit), Mzab Berber and Tuareg Berber (Tamahaq) (Kebieche, 2021). Algeria has 7 sites listed as world cultural heritage: The Kalâa of Béni Hammad, Djemila, Tassili n'Ajjer, Timgad, Tipasa, M'Zab Valley and Casbah of Algiers (UNESCO, 1992-2024). In this context, the work presented is an ethnobotanical study on traditional medicine practiced by the inhabitants of 25 villages in the Tiaret region (Algerian highlands). This study was very in-depth and carried out in two successive years just after the end of the COVID-19 period. This period clearly revealed the importance of herbal medicine and traditional medicine, especially among urban populations and developed countries in general.

MATERIAL AND METHODS

Study area

The city of Tiaret is one of the 14 cities located in the

Algerian highlands (Figure No. 1). Algerian highlands are located between the Tell Atlas (Algerian Tell) in the North and the Saharan Atlas in the South, from the border of Morocco to that of Tunisia1, at varying altitudes of 900 to 1,200 m. They cover a total area of 20 million hectares (**https://fr.wikipedia.org/wiki/Hauts_Plateaux_(Alg%C3%A9rie)**). They widen from some hundred kilometers in Constantinois to several hundred kilometers on the Moroccan border (Nedjraoui & Bedrani, 2008).

The wilaya of Tiaret is in the west of the country, more than 300 km southwest of the Algerian capital, it is located between 35°01'25.2'' N and 35°22'02.5''N latitude and 01°49'02.2''E and 01°20'20.7''E longitude. With an altitude between 970 and 1,143 m. (Maghni *et al*., 2018). This wilaya, because of its geographical location on the western highlands, has an agropastoral vocation. It extends over 20,113.90 km^2 (Figure No.1) and has a population of 988,139 inhabitants (ANIREF, 2018). The dry period in our study area is five months from May to October. The Emberger rainfall quotient of site 1 is 33.38, which allows us to classify this region in the lower semi-arid bioclimatic stage in fresh winter with an annual rainfall of 330 mm (Maghni *et al.*, 2023).

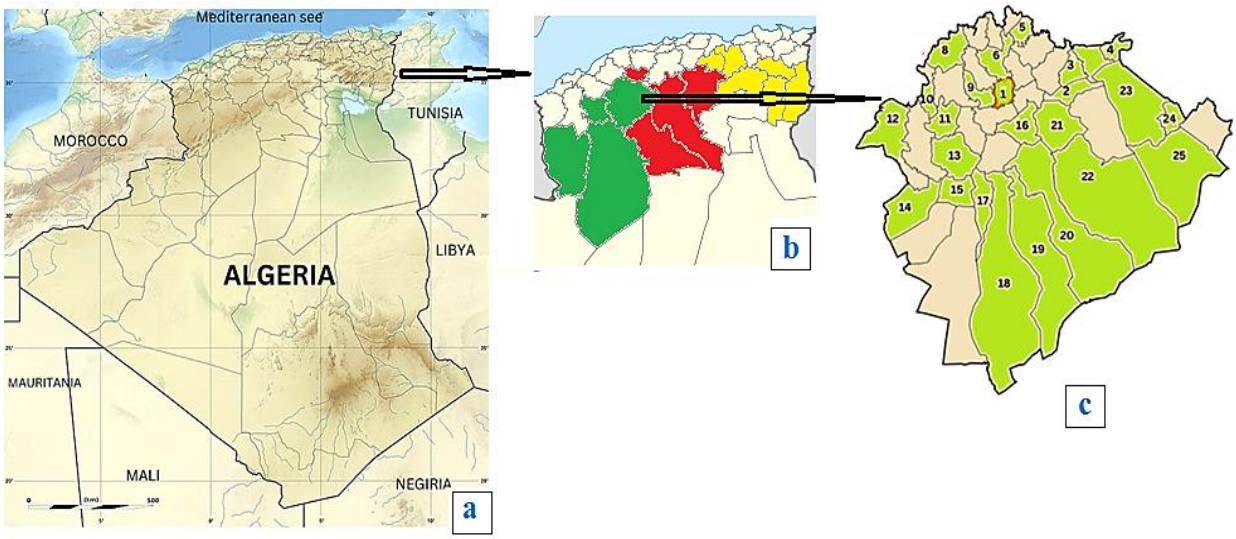

Figure No. 1

Geographic location of the study area: a: Carte of Algeria: b: Algerian highlands (in color, green, red, and yellow); c: carte of Tiaret (study erea) and the villages of the informants, numbered from 1 to 25 :1 :Tiaret (Chief town) 2 :Ain Dheb, 3 :Mahdia, 4 :Bougara, 5 :Meghila, 6 :Oued Lili, 7 :Sidi.Ali.Mellal, 8 :Rahouia, 9 :Tagdempt, 10 :Djilali Ben Amar, 11 :Sidi Bakhti, 12 :Takhmaret, 13 :Frensa, 14 :Rosfa, 15 :Ain Kermes, 16 :Sougueur, 17 :Medroussa, 18 :Sidi.Abd.Errahmane, 19 :Chehaima, 20:Ain dheb, 21 :Sidi abdelghani, 23 Rechaiga, 24 : K.Chellala, 25 :Zmalet Emir.Abd Elkader.

Data collections

We carried out a semi-structured interview adapted by Alexiades (1996) and Martin (1995). This type of interview, in addition to the list of questions and subjects that must be addressed, allows us to be flexible with the informants. Interviews were conducted in Arabic, the mother tongue of all participants.

To have a high degree of trust between us and the local population, we used to contact farmers who were designated by the central state agricultural directorate. Each contact farmer represents the head of the commune's population, all of whom trust him, because he serves as a liaison between them and the administration of the agricultural department. The contact farmer enabled us to get closer to people knowledgeable about medicinal plants and herbal medicine. Among these people, we find herbalists, traditional healers, grandfathers and grandmothers who practice traditional medicine. The

ethnobotanical survey is carried out over two successive years, from March 2022 to March 2024, just after the coronavirus period, to have the reactions and new conceptions of the inhabitants of the region towards plants, medicinal products, their uses and their importance. A total of 313 informants belonging to the 25 villages were interviewed (Figure No. 1). Among these informants we find 47 traditional practitioners, 26 herbalists and 240 inhabitants.

Plant collection and identification

For a correct identification of the medicinal plants declared by the informants (Arabic names) and to give them their scientific names, the plants were collected and transferred in the fresh state in addition to their specimens (dried plants) which were prepared on place. The identification of the different species was carried out at the plant protection laboratory level of our Faculty of Natural and Life Sciences (SNV) of the University of Ibn-Khaldoun, Tiaret (Algeria). We base ourselves on the confirmations of our teacher-researchers specializing in botany and on the bibliographical references available at our university library, such as such as Illustrated Guide: Flora and Vegetation of Algeria (Kaabeche, 2022), the Plant List database **http://www.theplantlist.org**, he Illustrated Guide to the Algerian flora (Wilaya of Algiers & Town Hall of Paris, 2012) available online **http://ark.bnf.fr/ark:/12148/cb426304502**, and the New Flora of Algeria (Quezel & Santa, 1963).

Data analysis

Data were analyzed quantitatively using Use Report (UR), Frequency of Citation (FC), use value and the Informant Consensus Factor (ICF). MS Excel was used for data entry and summary.

Frequency of citation (FC) and Use report (UR)

UR and FC are the most used calculations for determining the accuracy of ethnobotanical data. UR was assessed by calculating the total uses for the natural product by all informants within each use-category for that product (Prance *et al*., 1987). FC calculates the notional importance of each plant taxon without considering the ailment categories (Hoffman & Gallaher, 2007), while also showing their cultural significance (Tardío & Pardo-de-Santayana, 2008)

Use value (UV)

Use value reflects the local significance of a medicinal plant in the area. It was calculated following (Thomas *et al*., 2009; Yabesh *et al*., 2014; Houéhanou *et al*., 2016):

$$UVs = \Sigma Us/N$$

With UV, the number of uses for each species by number of informants, N, the total number of informants.

Informant Consensus Factor (ICF)

Informant Consensus Factor (ICF) is useful for assessing informant agreements on the therapies reported for each category of use (Khan *et al*., 2014). The ICF is calculated according to the following formula:

$$ICF = N_{ur} - N_t / N_{ur} - 1$$

Where N_{ur} is the number of reports of use in each disease category and N_t is the number of species used The values of the index range between 0 and 1, where values close to '1′ indicate the highest level of consensus (Andrade-Cetto & Heinrich, 2011)

RESULTS

Socio-demographic characteristics of the informants

The sociodemographic characteristics of the informants are mentioned in Table No. 1. These informants are divided into 47 traditional practitioners, 26 herbalists and 240 inhabitants. Among the 240 are farmers, foresters, shepherds, villagers and housewives. The informants are dominated by men (55%).

We distinguished four different age classes of informants, in a decreasing order of percentage of informants who participated in this ethnobotanical survey, we find the class between 40-60 years old with (55%), >60 years old constitute (29 %), between 20-40 years (14%) and <20 years (2%). The informants are also divided into four groups according to their level of education. Indeed, 44% illiterate, 20% have a primary level, 18% of secondary level, 12% middle and 6% are university students.

Table No. 1
Sociodemographic characteristics of the informants

Socio-demographic variables		Number	Percentage (%)
Gender	Male	172	55
	Female	141	45
Age (years)	<20	5	2
	20-40	43	14
	40-60	173	55
	>60	92	29
Education	Illiterate	136	44
	Primary	61	20
	Middle	42	12
	Secondary	56	18
	University	18	6
Family situation	Married	234	75
	Devoured	9	3
	Widower	37	12
	Single	33	10

Diversity of Medicinal plants traditionally used by the population of Tiaret

The analysis of the results obtained from this ethnobotanical study showed that 121 species were cited by the informants. These species are derived from 108 genera, and these genera belong to 49 botanical families (Figure No. 2; Table No. 2). The Asteraceae family is represented by 17 species and 14 genera, followed by Lamiaceae (11 genera and 16 species) and Apiaceae (eight genera and eight species).

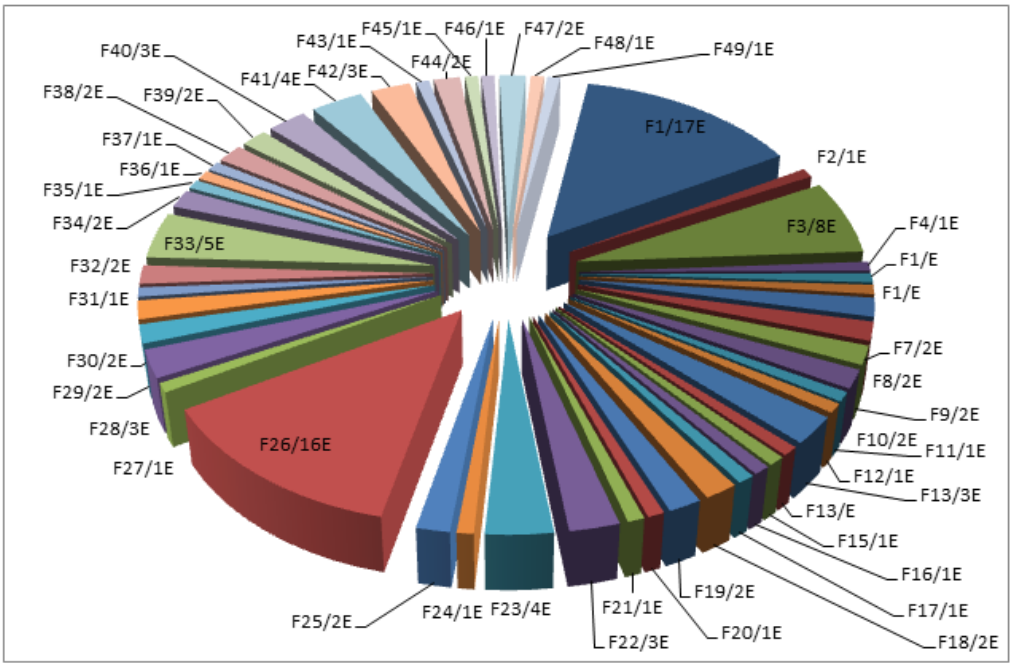

Figure No. 2
Specific richness of the listed botanical families

Table No. 2
Names of botanical families and number of species cited in Figure No. 2

Botanical family (F)	Number of Species (E)	Botanical family (F)	Number of Species (E)
Asteraceae	17	Lamiaceae	16
Asphodelaceae	1	Linaceae	1
Apiaceae	8	Malvaceae	2
Aloeaceae	1	Moraceae	2
Asparagaceae	1	Myrtacea	2
Aristolochiaceae	1	Nitrataceae	1
Amaryllidaceae	2	Plantaginaceae	2
Amaranthaceae	1	Poaceae	5
Arecaceae	2	Pinaceae	2
Anacardiaceae	2	Papaveraceae	1
Apocynaceae	1	Pezizaceae	1
Araliaceae	1	Paeoniaceae	1
Brassicaceae	3	Urticacees	2
Boraginaceae	1	Ranunculacea	2
Cactaceae	1	Rosaceae	3
Capparaceae	1	Rhamnaceae	4
Caulchicaceae	1	Rutaceae	3
Cucurbitaceae	2	Salicaceae	1
Cupressaceae	2	Solanaceae	2
Crassulaceae	1	Tamaricaceae	1
Droseraceae	1	Thymeleacées	1
Euphorbiaceae	3	Zingiberaceae	2
Fabaceae	4	Zygophyllaceae	2
Fagaceae	1	Xanthorrhoeaceae	1
Lauraceae	2		

Figure No. 3
Some medicinal plants from study site area: a: *Zizyphus lotus* (L.) Lam; b: *Thymus algeriensis* Bioss. & Rent; c: *Thymelaea microphylla* Coss. et Dur; d: *Marrrubium vulgare* L.; e: *Pistacia lentiscus* L.; f: *Artemisia herba-alba* Asso; g: *Peganum harmala* L; h: *Opuntia-ficus-indica* (L.) Mill

Table No. 3
List of medicinal plants used by informants from the Algerian highlands

Family	Scientific name	Vernacular name in Arabic	Origin
Lamiaceae	*Ajuga iva* (L.) Schreb	Chandgoura	Native
Xanthorrhoeaceae	*Aloe vera* (L.) Burm. f	Sebbar	Exotico
Amaryllidaceae	*Allium cepa* L.	Bossaila	Exotico
Amaryllidaceae	*Allium sativum* L.	Toum	Exotico
Apiaceae	*Ammoides pusilla* (Brot.) Breistr.	El noukha	Native
Asteraceae	*Anacyclus clavatus* (Desf.) Pers	Boubicha	Exotico
Asteraceae	*Anacyclus pyrethrum* (L.) Lag	Tiguentes	Native
Brassicaceae	*Anastatica hierochuntica* L.	Chajarat Mariam	Native
Apiaceae	*Anethum foeniculum* L.	Besbas	Native
Apiaceae	*Apium graveolens*	Marrafes	Native
Aristolochiaceae	*Aristolochia paucinervis* Pomel.	Berrostom	Native
Asteraceae	*Artemisia absinthium* L.	Chehiba	Native
Asteraceae	*Artemisia campestris* L.	Dgoffet	Native
Asteraceae	*Artemisia herba-alba* Asso	Chih	Native
Asparagaceae	*Asparagus officinalis* L.	Sakkom	Native
Asphodelaceae	*Asparagus officinalis* L.	Berwag	Native
Asteraceae	A*tractylis serratuloides* Sieber ex Cass	Chandar el djemel	Native
Amaranthaceae	*Atriplex halimus* L.	Gataf	Native
Apiaceae	*Avena sativa* L.	Khortal	Native
Amaranthaceae	*Beta vulgaris* L.	Selk	Native
Boragenaceae	*Borago officinalis* L.	Lessane el thawr	Native
Apiaceae	*Bunium pachypodum* P. W. Ball	Talalghuda	Native
Asteraceae	*Calendula arvensis* M. Bieb.	Jemra	Native
Asteraceae	*Carlina gummifera* (L.) Less	El ddad	Native
Capparaceae	*Capparis spinosa* L.	Kebbar	Native
Brassicaceae	Capsella bursa-pastoris (L.) Medik	Keiss errai	Native
Solanaceae	*Capsicum annuum* L.	Elharra	Exotico
Fabaceae	*Ceratonia siliqua* L.	Kharoub	Native
Arecaceae	*Chamaerops humilis* L.	Doum	Native
Lauraceae	*Cinnamomum virum* J. Presl	Karfa	Exotico
Ranunculaceae	*Clematis flammula* L.	Tadadine	Native
Colchicaceae	*Colchicum autumnale* L.	Elhalhal	Native
Apiaceae	*Coriandrum sativum* L.	Kosbor	Exotico
Cucurbitaceae	*Cucurbita pepo* L.	Karaa Khedra	Exotico
Zingiberaceae	*Curcuma longa* L.	Karrakum	Exotico
Rosaceae	*Crataegus monogyna* L.	Ain Elbakra	Native
Solanaceae	*Datura stramonium* L.	Baroud	Exotico
Asteraceae	*Dittrichia viscosa* (L) Greuter	Magraman	Native
Droseraceae	*Drosera rotundifolia* L.	Ferach ennada	Exotico
Asteraceae	*Echinops spinosus* L.	Tassekra	Native
Cucurbitaceae	*Ecbalium elaterium* (L) A. Rich	Fegous lehmir	Native
Poaceae	*Elytrigia repens* (L.) Desv. ex Nevski	Nedjm	Native
Myrtaceae	*Eucalyptus camaldulensis* Dehnh	Kalitous	Exotico
Euphorbiaceae	*Euphorbia helioscopia* L.	Halib el doba	Native
Euphorbiaceae	*Euphorbia cornuta* Pers	Eldjarraba	Native
Zygophyllaceae	*Fagonia scabra* Forssk	Bouchouka	Native
Apiaceae	*Ferula communis* L.	Lkalkha	Native
Moracées	*Ficus carica* L.	Karmoss	Native
Plantaginaceae	*Globularia alypum* L.	Tasselgha	Native
Fabaceae	*Glycyrrhiza glabra* L.	Eirqsos	Exotico
Rutaceae	*Ruta tuberculata* Forssk	Fidjel	Native
Rutaceae	*Haplophyllum tuberculatum* (Forssk.) A. Juss	Chadjret Errih	Native
Araliaceae	*Hedera helix* L.	Louaya	Native
Malvaceae	*Hibiscus sabdariffa* L.	Karkadiya	Exotico
Cupressaceae	*Juniperus oxycédrus* L.	Taga	Native
Cupressaceae	*Juniperus* phoenicea L.	Arâr lahmar	Native
Lauraceae	*Laurus nobilis* L.	Rand	Native

Asteraceae	*Launaea capitata* (Spreng.) Dandy	Harcha	Native
Lamiaceae	*Lavandula dentata* L.	Khozama	Native
Lamiaceae	*Lavandula angustifolia* Mill.	Khozama	Exotico
Lamiaceae	*Lavandula stoechas* L.	Halhal	Native
Brassicaceae	*Lepidium sativum* L.	Hab Elrochadd	Exotico
Linaceae	*Linum usitatissimum* L.	Ziriat Elkaten	Native
Poaceae	*Lygeum spartum* L.	Senagh	Native
Poaceae	*Macrochloa tenacissima* (L.) Kunth	Halfa	Native
Malvaceae	*Malva sylvestris* L.	Khobeiz	Native
Lamiaceae	*Marrubium vulgare* L.	Merriwet	Native
Asteraceae	*Matricaria chamomilla* L.	Elbabounedj	Native
Lamiaceae	*Melissa officinalis* L.	Tizana	Native
Moracées	*Morus nigra* L.	Tout lekhal	Exotico
Lamiaceae	*Mentha piperita* L.	Nanaa	Exotico
Lamiaceae	*Mentha pulegium* L.	Filyou	Native
Lamiaceae	*Mentha suaveolens* Ehrh.	Merssat	Native
Ranunculaceae	*Nigella sativa* L.	Sanoudj	Exotico
Apocynaceae	*Nerium oleander* L.	Deffla	Native
Lamiaceae	*Ocimum basilicum* L.	El habak	Exotico
Aloeaceae	*Olea europaea* L.	Zitoun	Native
Fabaceae	*Ononis spinosa* L.	Nabta	Native
Asteraceae	*Onopordum macracanthum* Schousb.	El Khourchef El Barri	Native
Cactaceae	*Opuntia ficus-indica* (L.) Mill.	Karmous Barbari	Exotico
Paeoniaceae	*Paeonia officinalis* L.	Warda Nassraniya	Exotico
Papaveraceae	*Papaver rhoeas* L.	Benaâmane	Native
Urticacees	*Parietaria officinalis* L.	Fetat lehdjar	Exotico
Nitrataceae	*Peganum harmala* L.	Harmal	Native
Apiaceae	*Petroselium crispum* (Mill.) Fuss	Maadnous	Exotico
Pinaceae	*Pinus halepensis* Mill.	Sanoubar	Native
Pinaceae	*Pinus pinaster* Aiton	Tayda	Native
Anacardiaceae	*Pistacia atlantica* Desf.	Pistache	Native
Anacardiaceae	*Pistacia lentiscus* L.	El Darow	Native
Arecaceae	*Phoenix dactylifera* L.	Nakhil El tamr	Native
Plantagenaceae	*Plantago major* L.	Lissan Elhamel	Native
Salicaceae	*Populus alba* L.	Sefsa	Native
Rosaceae	*Prunus dulcis* (Mill.) D. A. Webb	Ellouz	Exotico
Fagaceae	*Quercusilex* L.	Ballout	Native
Crassulaceae	*Umbilicus rupestris* (Salib.) Dandy	Wadan Elchikh	Native
Papaveraceae	*Papaver rhoeas* L.	Benaâmane	Native
Urticaceae	*Urtica dioica* L.	Horeig	Native
Rhamnaceae	*Rhamnus alaternus* L.	M'liles	Native
Asteraceae	*Rhaponticum acaule* (L.) DC.	Tafgha	Native
Euphorbiaceae	*Ricinus communis* L.	El Kharwa	Exotico
Lamiaceae	*Rosmarinus officinalis* L.	Iklil eldjabal	Native
Rosaceae	*Rubus ulmifolius* Schott.	El Allaigue	Native
Rutaceae	*Ruta graveolens* L.	Tigontes	Exotico
Lamiaceae	*Salvia officinalis* L.	Meramia	Exotico
Lamiaceae	*Salvia sclarea* L.	Souj	Native
Asteraceae	*Scolymus hispanicus* L.	Garnina	Native
Asteraceae	*Silybum marianum* (L.) Gaertn.	El khorchif	Native
Brassicaceae	*Sinapis arvensis* L.	Khardal	Native
Asteraceae	*Pseudopodospermum undulatum* (Vahl) Zaika, Sukhor & N. Kilian	Talma	Native
Lamiaceae	*Stachys officinalis* (L.) Trevis.	Elkihyata	Native
Myrtaceae	*Syzygium aromaticum* L**.**	El koronfel	Exotico
Tamaricaceae	*Tamarix gallica* L**.**	Tarfa	Native
Lamiaceae	*Teucrium polium* L.	Djaida	Native
Apiaceae	*Thapsia garganica* L.	Deryas	Native
Thymelaeaceae	*Thymelaea microphylla* Coss.et Dur	Methnène	Native
Lamiaceae	*Thymus algeriensis* Bioss. & Rent	El zaatar	Native
Malvaceae	*Tilia platyphyllos* Scop	Ezaizafoun	Exotico
Fabaceae	*Trigonella foenum-graecum* L.	Halba	Exotico

Poaceae	*Triticum durum* Desf**.**	Gamh	Native
Fabaceae	*Vicia benghalensis* L.	Jelbanet Lehnouch	Native
Zingiberaceae	*Zingiber officinale* Roscoe	Zendjabil	Exotico
Rhamnaceae	*Ziziphus lotus* (L.) Lam.	Sedra	Native

Table No. 4
List of medicinal plants used by informants from the Algerian highlands

Family	Scientific name	FC	UR	UV	Plant part used	Preparation	Therapeutic use categories	Administration
Lamiaceae	*Ajuga iva* (L.) Schreb	110	133	0.42	St, L	Decoction, infusion	High blood pressure, diabetes, cancer, respiratory (asthma), female sterility, coronavirus (to relieve cases of dyspnea, headaches, fever, fatigue)	Oral ingestion (drink)
Xanthorrhoeaceae	*Aloe vera* (L.) Burm. f	102	119	0.29	L	Juice, raw	Liver damage, rheumatism, dermatological	Topical, oral ingestion (drink)
Amaryllidaceae	*Allium cepa* L.	74	96	0.17	B	Decoction, juice, poultices	Digestive, respiratory, ear and throat, coronavirus (to relieve cases of dyspnea, headaches, fever, fatigue)	Topical, oral ingestion (drink, food)
Amaryllidaceae	*Allium sativum* L.	120	137	0.47	B	Infusion, powder	Respiratory, digestive, muscular dermatological, urological, ear and throat, cancer, cases, cysts, Coronavirus (to relieve cases of fever)	Oral ingestion (food), ear drops, topical
Apiaceae	*Ammoides pusilla* (Brot.) Breistr.	140	165	0.65	St, L	Infusion	Digestive, respiratory	Oral ingestion (drink)
Asteraceae	*Anacyclus clavatus* (Desf.) Pers	125	139	0.47	R	Decoction, powder	Rheumatism, digestive (stomach ulcer)	Oral ingestion, topical
Asteraceae	*Anacyclus pyrethrum (*L.) Lag	112	137	0.44	R	Decoction powder	Liver diseases, joint rheumatism, digestive (gastroenteritis)	Oral ingestion (food), topical
Brassicaceae	*Anastatica hierochuntica* L.	98	124	0.23	L, R	Decoction	Stimulates the fertility of the home and the woman, blood (anemia), urological (urinary infections)	Oral ingestion (drink)
Apiaceae	*Anethum foeniculum* L.	135	159	0.63	S, R	Infusion	Digestive (gastrointestinal pain), coronavirus (to relieve cases of headaches, fever, fatigue)	Oral ingestion (drink, food)
Apiaceae	*Apium graveolens*	82	107	0.17	L	Infusion	Eliminate toxins	Oral ingestion (drink, food)
Aristolochiaceae	*Aristolochia paucinervis* Pomel.	132	150	0.57	Rz	Powder mixed with honey	Cases of cancer, cysts dermatological (antiseptic and healing of wounds and wounds	Oral ingestion(food), Topical
Asteraceae	*Artemisia absinthium* L.	126	146	0.61	L, St	Infusion	Endocrinien, respiratory, digestive (worming), coronavirus (to relieve cases of dyspnea, fever, and to disinfect the air)	Fumigation, oral ingestion (drink)
Asteraceae	*Artemisia campestris* L.	142	153	0.54	L, St, Fl	Decoction	Rheumatism (relieves joint pain)	Oral ingestion, (drink)
Asteraceae	*Artemisia herba-alba* Asso	172	191	0.80	St, L	Infusion, fumigation	Digestive (worming), cardiovascular, respiratory, coronavirus (to relieve cases of dyspnea, headaches, fever, and to purify and disinfect the air)	Oral ingestion(drink)
Asparagaceae	*Asparagus officinalis* L.	143	152	0.57	St, L	In food,	Skeletal (osteoporosis), digestive	Oral ingestion (food)
Asphodelaceae	*Asphodelus ramosus* L.	75	102	0.25	St, Rz	Decoction	Ear (case of otitis) and throat	Ear drops
Asteraceae	A*tractylis serratuloides* Sieber ex Cass	86	120	0.22	R	Decoction	Endocrinien (cholelithiasis), circulatory disorders	Oral ingestion (drink, food)
Amaranthaceae	*Atriplex halimus* L.	147	168	0.60	L	Powder mixed with honey	Anti-diabetic, cancer, cases, cysts	Oral ingestion
Apiaceae	*Avena sativa* L.	85	115	0.20	G	Decoction	Urological (kidney stones)	Oral Ingestion (drink)
Amaranthaceae	*Beta vulgaris* L.	118	152	0.47	L	Decoction, in food.	Hepatoprotective urological (kidneys), stimulation of immune systems, cancer treatment	Oral Ingestion (food)

Boragenaceae	*Borago officinalis* L.	94	119	0.35	Fl, L, R	Infusion, poultices	Skeletal (plaster for bone fractures), urological (against kidney stones and urine retention)	Oral ingestion (drink), topical
Apiaceae	*Bunium pachypodum* P. W. Ball	129	151	0.61	L, R	Powder mixed with honey	Endocrine (Goiters) Rheumatism	Oral ingestion (food)
Asteraceae	*Calendula arvensis* M. Bieb.	112	145	0.51	Fl	Infusion	Respiratory (inflammation of the oral mucosa or pharynx (sore throat).	Oral ingestion (drink)
Asteraceae	*Carlina gummifera* (L.) Less	115	140	0.47	R, Fr	Decoction	Rheumatism (colds), neurological (headaches and pralysis), cancer, cases, cysts	Fumigation (R) Oral ingestion (Fr)
Capparaceae	*Capparis spinosa* L.	69	111	0.15	Wp	Decoction	Female sterility, cancer, cases, cysts	Oral ingestion (drink)
Brassicaceae	*Capsella bursa-pastoris* (L.) Medik	62	118	0.22	L, Fl	Infusion	Urinary infections (cystitis)	Oral ingestion (drink)
Solanaceae	*Capsicum annuum* L.	58	122	0.28	L, St, Fl	Decoction	Kidney conditions	Oral ingestion (drink, food)
Fabaceae	*Ceratonia siliqua* L.	120	148	0.54	Fr, Fl	Infusion	Kidney conditions, digestive	Oral ingestion (food)
Arecaceae	*Chamaerops humilis* L.	105	130	0.34	L, R, Fr, P	Maceration	Men sterility, lower blood pressure	Topic, wound
Lauraceae	*Cinnamomum virum* J. Presl	153	173	0.68	L, E	Decoction	Stimulating blood circulation (pregnancy), strengthens the immune system, respiratory (bronchial infections), rheumatism, coronavirus (to relieve cases of dyspnea, fever, fatigue and to purify and disinfect the air)	Oral ingestion (drink, food), topic plaster
Ranunculaceae	*Clematis flammula* L.	130	163	0.60	R	Poultices	Pest removal	Topic, plaster
Colchicaceae	*Colchicum autumnale* L.	128	132	0.47	B	Decoction	Articular rheumatism	Oral ingestion (drink)
Apiaceae	*Coriandrum sativum* L.	121	158	0.59	Fr, S	Infusion	Digestive	Oral ingestion (drink, food)
Cucurbitaceae	*Cucurbita pepo* L.	116	145	0.41	Fr, G	Décoction	Antidiabetic (lower blood sugar), urological (irritable bladder)	Oral ingestion (food)
Zingiberaceae	*Curcuma longa* L.	128	135	0.31	Rz	Decoction, powder, with honey, milk and food, Infusion, Raw, juice.	Respiratory, cardiovascular, digestive, muscular, skeletal, neurological, reproductive system, corona virus (to relieve cases of fever and fatigue), cancer, cases, cysts	Oral ingestion (drink, food) Topic
Rosaceae	*Crataegus monogyna* L.	110	133	0.38	Fr, R	Infusion, decoction	Cardiological (atherosclerosis, cardiac fatigue), blood (arrhythmia of the heart, hypertension, hypotension)	Oral ingestion (food)
Solanaceae	*Datura stramonium* L.	92	121	0.19	L, Fr, R	Decoction	Respiratory (asthma, cough, bronchitis), neurological (parkinson's disease), tuberculosis	Ingestion (drink)
Asteraceae	*Dittrichia viscosa* (L) Greuter	148	175	0.64	L	Decoction, poultices	Digestive, dermatological (hemostatic and healing of skin wounds and purulent dermatoses)	Ingestion (drink), topic, wound
Droseraceae	*Drosera rotundifolia* L.	78	100	0.12	L, St, Fl	Eaten directly	Osteoarticular disorders	Oral ingestion (food)
Asteraceae	*Echinops spinosus* L.	115	130	0.44	L, R	Decoction, poultices	Eye conditions (due to heat), dermatological, digestive (digestive disorders)	Oral ingestion (drink), topic
Cucurbitaceae	*Ecbalium elaterium* (L) A. Rich	120	155	0.63	Fr, R.	Infusion	Conditions Jaundice	Nasal drops
Poaceae	*Elytrigia repens* (L.) Desv. ex Nevski	84	105	0.23	R	Decoction	Urological, rheumatism, liver disorders (Jaundice, gallstones)	Oral ingestion (drink)
Myrtaceae	*Eucalyptus camaldulensis* Dehnh	155	180	0.70	L	Infusion, poultices	Respiratory (bronchitis and flu), coronavirus (to relieve cases of dyspnea, purify and disinfect the air)	Fumigation, topic
Euphorbiaceae	*Euphorbia helioscopia* L.	93	125	0.28	Lt, L	Infusion, poultices	Stimulates lactation in breastfeeding women, dermatological (ulcers, warts, wounds and skin burns), respiratory	Topic
Euphorbiaceae	*Euphorbia cornuta* Pers	92	125	0.25	L, Fr,	Infusion	Anti-inflammatoire	Topic

					R			
Zygophyllaceae	*Fagonia scabra* Forssk	119	141	0.47	L	Infusion	Dermatological (skin lesions), digestive (gastrointestinal disorders)	Topic, oral, ingestion (drink)
Apiaceae	*Ferula communis* L.	85	121	0.22	L	Decoction	Endocrine (against hyperthyroidism) treat cancer, stomach pain	Oral ingestion (drink)
Moracées	*Ficus carica* L.	124	141	0.44	Fr	Mixed with olive oil	Respiratory, cardiovascular, digestive (gastrointestinal disorders)	Oral ingestion (food)
Plantaginaceae	*Globularia alypum* L.	74	99	0.19	F, R	Decoction	Urological (kideny), Diabetes	Oral ingestion (drink)
Fabaceae	*Glycyrrhiza glabra* L.	110	128		R	Infusion, powder, poultices	Respiratory (throat and lungs, asthma, bronchitis), rheumatism, digestive (stomach ulcer)	Oral ingestion (drink), topic
Rutaceae	*Haplophyllum tuberculatum* (Forssk.) A. Juss	135	154	0.57	L, St	Decoction, poultices	Digestive (antispasmodique, vermifuge), against scorpion stings, against female sterility	Oral ingestion (drink), topic, wound, fumigation
Araliaceae	*Hedera helix* L.	95	137	0.33	L, St	Decoction, poultices	Respiratory (asthma), dermatological (thickening of the skin of the foot at pressure points)	Oral ingestion (drink), topic
Malvaceae	*Hibiscus sabdariffa* L.	86	124	0.19	L, Fr	Decoction	Blood (regulates blood pressure)	Oral ingestion (drink)
Cupressaceae	*Juniperus oxycédrus* L.	103	142	0.44	Fr	Tinctures, powder, decoction,	Urological (urinary problems), digestive, respiratory (asthma)	Oral ingestion (drink), topic
Cupressaceae	*Juniperus* phoenicea L.	125	147	0.49	L, Fr	Decoction Poultices	Neurological conditions, coronavirus (to relieve cases of dyspnea, to disinfect the air)	Oral ingestion (drink), fumigation, topic
Lauraceae	*Laurus nobilis* L.	105	133	0.30	L	Infusion Decoction	Digestive (bloating, flatulence), oral discomfort (gingivitis, mouth ulcers), rheumatism (joint pain)	Oral ingestion (drink, food)
Asteraceae	*Launaea capitata* (Spreng.) Dandy	90	117	0.24	L, R	Infusion powders	Antidiabetic	Oral ingestion (drink, food)
Lamiaceae	*Lavandula dentata* L.	125	134	0.42	Fl	Decoction, poultices	Urogenital infection, respiratory (bronchitis), rheumatism	Oral ingestion (drink), wash, topic
Lamiaceae	*Lavandula angustifolia* Mill.	130	144	0.47	L, Fl	Decoction	Digestive (dewormers)	Oral ingestion (drink), wash
Lamiaceae	*Lavandula stoechas* L.	134	139	0.41	L, Fl	Infusion, fumigation	Digestive (gastralgia), respiratory (Flu), coronavirus (to relieve cases of dyspnea, fever, and to disinfect the air)	Oral ingestion (drink, food), wash
Brassicaceae	*Lepidium sativum* L.	135	143	0.43	S	Infusion	Sexual impotence, skeletal (osteoarticular disorders), respiratory (cough, asthma, bronchitis)	Oral ingestion (food), plaster, topic
Linaceae	*Linum usitatissimum* L.	122	152	0.52	S	Infusion	Respiratory (bronchitis)	Oral ingestion (drink, food)
Poaceae	*Lygeum spartum* L.	95	134	0.41	St, G	Infusion, decoction	Dermatological (eczema), neurological (neuralgia)	Oral ingestion (drink), topic
Poaceae	*Macrochloa tenacissima* (L.) Kunth	65	83	0.13	L	Decoction	Digestive	Oral ingestion (food, drink)
Malvaceae	*Malva sylvestris* L.	111	136	0.54	L	Decoction, poultices	Respiratory (bronchitis), digestive (against gastrointestinal conditions)	Oral ingestion (food), topic
Lamiaceae	*Marrubium vulgare* L.	126	133	0.52	L	Infusion, poultices	Respiratory (asthma, bronchitis), dermatological (abscess, healing)	Oral ingestion (drink), topic, wound
Asteraceae	*Matricaria chamomilla* L.	150	162	0.64	Fl	Infusion Poultices	Digestive, stress, dermatological (eczema), hemorrhoids	Oral ingestion (drink), topic
Lamiaceae	*Melissa officinalis* L.	103	136	0.41	L	Decoction	Blood (regulate blood pressure)	Oral ingestion (drink)
Moracées	*Morus nigra* L.	94	131	0.30	L, Fr	Decoction, raw (eaten directly)	Diabetes, respiratory (sore throat, tonsillitis)	Oral ingestion (drink, food)
Lamiaceae	*Mentha piperita* L.	133	167	0.64	L, St	Decoction, infusion	Neurological, digestive (bronchitis), Musculo-skeletal (joint, muscle pain), coronavirus (to relieve cases of dyspnea, headaches, fever), respiratory (influenza)	Oral ingestion (drink)
Lamiaceae	*Mentha pulegium* L.	137	162	0.61	L, St, Fl	Infusion, poultices	Respiratory disorders (colds, sore throats, coughs, bronchitis, asthma, lung infections, influenza	Oral ingestion (drink)
Lamiaceae	*Mentha suaveolens* Ehrh.	132	148	0.54	L	Decoction, poultices	Digestive (tonics, stomachics and antispasmodics), treat hemorrhoids	Oral ingestion (drink), topic
Ranunculaceae	*Nigella sativa* L.	122	145	0.51	S	mixed with olive oil or honey	Respiratory (flu, bronchitis, asthma), digestive (gastrointestinal pain), cancer, cases, cysts	Oral ingestion (drink, food)
Apocynaceae	*Nerium oleander* L.	110	132	0.39	L, Fl	Infusion	Antidiabetic, urological (diuretic),	Oral ingestion (food),

							cardiotonic, rheumatism	topic
Lamiaceae	*Ocimum basilicum* L.	94	125	0.33	L, St	Decoction	Blood pressure, dermatological	Oral ingestion (drink), topic
Aloeaceae	*Olea europaea* L.	134	150	0.58	L, Fr	Fruit and oil consumed directly Infusion of the leaves	Digestive (antispasmodic constipation), gallstones, cardiovascular illnesses, diabetes and cough, insufficiency hepatic	Oral ingestion (drink, food), Ear, Drop, topic, wound, nasal
Fabaceae	*Ononis spinosa* L.	138	160	0.57	Wp	Infusion	Eliminate toxins	Oral ingestion (drink)
Asteraceae	*Onopordum macracanthum* Schousb.	108	145	0.41	L	Decoction	Urological (genitourinary and renal)	Oral ingestion (drink, food)
Cactaceae	*Opuntia ficus-indica* (L.) Mill.	112	152	0.56	Fr, St, R	Fruit eaten directly, infusion of flowers, decoction	Antidiabetic (hypoglycemic effect powerful), digestive (antidiarrheal), urological (kidney stones)	Oral ingestion (food), topic
Paeoniaceae	*Paeonia officinalis* L.	105	130	0.22	R, Fl	Decoction	Neurological (nervous conditions, epilepsy, hysteria and convulsions)	Oral ingestion (drink)
Papaveraceae	*Papaver rhoeas* L.	103	139	0.38	St	Decoction	Eye inflammations, dental abscesses	Oral ingestion (drink), wash
Urticacees	*Parietaria officinalis* L.	125	147	0.68	PE	Decoction	Renal lithiasis	Oral ingestion (drink)
Nitrataceae	*Peganum harmala* L.	127	135	0.51	S	mixed with olive oil or milk	Osteoarticular disorders	Oral ingestion (food), topic, plaser
Apiaceae	*Petroselium crispum* (Mill.) Fuss	98	118	0.28	S, R	Infusion	Eliminate toxins digestive (dewormers)	Oral ingestion (drink)
Pinaceae	*Pinus halepensis* Mill.	149	169	0.63	E, L, G	Decoction Essential oil	Respiratory (respiratory diseases), dermatological (skin burning, eczema)	Oral ingestion (drink), topic
Pinaceae	*Pinus pinaster* Aiton	125	145	0.51	R	Poultices	Dermatological (burns and eczema)	Topic, wound
Anacardiaceae	*Pistacia atlantica* Desf.	34	58	0.19	Fr	Fruit eaten directly	Throat infections, urological (kidney stones), toothache, dermatological (eczema, wound healing)	Oral ingestion (food)
Anacardiaceae	*Pistacia lentiscus* L.	115	135	0.36	L, Fr, R	Decoction, fumigation, essential oil, maceration, raw	Respiratory (asthma), liver necrosis	Oral ingestion (drink, food)
Arecaceae	*Phoenix dactylifera* L.	84	110	0.30	P, L, Fr	Mix with honey, decoction	Increase fertility, reduce high blood sugar	Oral ingestion (food)
Plantagenaceae	*Plantago major* L.	50	60	0.14	L	Infusion, poultices	Conjunctivitis, allergic, dermatological (insect bites)	Topic, wound
Salicaceae	*Populus alba* L.	130	140	0.37	L, R	Decoction, poultices	Urological (against hemorrhoids urinary infections), skeletal	Oral ingestion (drink)
Rosaceae	*Prunus dulcis* (Mill.) D. A. Webb	132	143	0.47	R	Decoction	Blood (anemia)	Oral ingestion (drink)
Asteraceae	*Pseudopodospermum undulatum* (Vahl) Zaika, Sukhor & N. Kilian	65	90	0.25	L	Infusion, raw (eaten directly)	Digestive (strengthen the internal stomach tissue), immune system and sensory organs	Oral ingestion (food)
Fagaceae	*Quercus ilex* L.	103	121	0.28	L, E, Fr	Decoction	Blood (hypotension), digestive (acute diarrhea, gastroenteritis, vaginal discharge), inflammations of the mucous membranes (mouth and throat), skin (dermatitis, frostbite, chapping wound healing)	Oral ingestion (food, drink)
Crassulaceae	*Umbilicus rupestris* (Salib.) Dandy	48	69	0.10	L	Poultices, raw (eaten directly)	Skin (healing), urological (urinary secretion)	Oral ingestion (food, drink), topic
Urticaceae	*Urtica dioica* L.	142	151	0.57	L	Decoction, maceration	Neurological conditions, Skeletal (osteoarticular disorders), cancer, cases, cysts	Oral ingestion (drink), topic, wound
Rhamnaceae	*Rhamnus alaternus* L.	130	145	0.53	L, Fr, R	Decoction	Neurological conditions, blood (anemia)	Oral ingestion (drink)
Asteraceae	*Rhaponticum acaule* (L.) DC.	71	125	0.35	R	Decoction, powder (Powders of root + egg yolk)	Respiratory (pulmonary conditions), digestive (intestinal diseases), endocrine (liver diseases)	Oral ingestion (food)
Euphorbiaceae	*Ricinus communis* L.	50	80	0.19	L, S	Poultices, infusion	Skin (treatment of warts, dermatological conditions), endocrine (indurations of the mammary glands)	Oral ingestion (food, drink), topic
Lamiaceae	*Rosmarinus officinalis* L.	159	172	0.67	L	Infusion, decoction	Hepatic (gallbladder, cholesterol), neurological (depression, memory,	Oral ingestion (food, drink), fumigation

							migraine, nervousness, sleep), osteoarticular (sprain, rheumatism, sciatica), coronavirus (to relieve cases of dyspnea, headaches, fever, and to disinfect the air)	
Rosaceae	*Rubus ulmifolius* Schott.	23	35	0.06	L, Fr	Decoction, raw (eaten directly)	Dermatological (healing of ulcers and burn wounds), against cancer	Oral ingestion (food, drink)
Rutaceae	*Ruta graveolens* L.	88	128	0.35	R	Decoction	Digestive (stomach), periodontal infections	Ingestion (food)
Lamiaceae	*Salvia officinalis* L.	150	163	0.66	L, St	Infusion	Gynological (insufficient periods, sterility), respiratory (asthma), antidiabetic, digestive, coronavirus (to relieve cases of dyspnea, headaches, fever, and to disinfect the air)	Oral ingestion (drink), fumigation
Lamiaceae	*Salvia sclarea* L.	45	85	0.12	Wp	Decoction	Respiratory (soothes the throat), digestive	Oral ingestion (drink)
Asteraceae	*Scolymus hispanicus* L.	39	77	0.17	L, Rz	Raw (eaten directly)	Digestive (gastritis)	Oral ingestion (food)
Asteraceae	*Silybum marianum* (L.) Gaertn.	109	137	0.42	L, Fr	Decoction	Hepatoprotective	Oral ingestion (drink, food)
Brassicaceae	*Sinapis arvensis* L.	104	125	0.23	L, Fl	Infusion	Digestive (digestive disorders, stomach and intestines), genicological (menstrual pain)	Oral ingestion (drink, food)
Asteraceae	*Pseudopodospermum undulatum* (Vahl) Zaika, Sukhor & N. Kilian	65	90	0.25	L	Infusion, raw (eaten directly)	Digestive (strengthen the internal stomach tissue), immune system and sensory organs	Oral ingestion (food)
Lamiaceae	*Stachys officinalis* (L.) Trevis.	71	98	0.22		L	Poultices	Dermatological (treat wounds), topic
Myrtaceae	*Syzygium aromaticum* L	145	161	0.60	S	Infusion, essential oil	Infections dental, coronavirus (to relieve cases of dyspnea, headaches, fever, fatigue)	Oral ingestion (drink, food), wash
Tamaricaceae	*Tamarix gallica* L**.**	43	85	0.13	E, Fl, L	Infusion, decoction	Arthritis and rheumatism, hepatoprotective	Oral ingestion (food), fumigation
Lamiaceae	*Teucrium polium* L.	134	158	0.66	L, Fl	Decoction, poultices	Gastrointestinal, hypoglycemic action, anticancer	Oral ingestion (drink), topic
Apiaceae	*Thapsia garganica* L.	98	111	0.33	L, R	Powder, infusion	Respiratory (lung problems), rheumatism, dermatological (wounds), against female sterility, gastrointestinal cancer, cases, cysts	Oral ingestion (drink, food), topic
Thymelaeaceae	*Thymelaea microphylla* Coss et Dur	70	104	0.23	L, St	Décoction	Anti hair loss, respiratory	Oral ingestion (drink), topic, wash
Lamiaceae	*Thymus algeriensis* Bioss & Rent	170	197	0.82	L	Infusion, fumigation	Respiratory, digestive, neurological, cardiovascular, against female sterility, coronavirus (to relieve cases of dyspnea, headaches, fever and to purify and disinfect the air)	Oral ingestion (drink), wash, fumigation
Malvaceae	*Tilia platyphyllos* Scop	78	104	0.21	Fl, Sw	Decoction	Neurologic (calming nervous), hepatoprotective digestive (ebrifuge and calmants)	Oral ingestion (drink)
Fabaceae	*Trigonella foenum-graecum* L.	129	154	0.57	S	Infusion	Cardiovascular conditions, respiratory (bronchitis), digestive (diarrhea), muscular and skeletal	Oral ingestion (drink, food), plaster
Poaceae	*Triticum durum* Desf**.**	77	115	0.34	L, Fr	Decoction	Neurological conditions	Oral ingestion (drink, food)
Fabaceae	*Vicia benghalensis* L.	75	105	0.20	L	Decoction, poultices	Digestive (gastric and duodenal pain)	Oral ingestion (drink, food), topic
Zingiberaceae	*Zingiber officinale* Roscoe	123	139	.041	Rz	Decoction, infusion, powder, raw	Cardiovascular, digestive, respiratory, against male sterility, muscular, reproductive, ear and throat, autoimmune diseases, coronavirus (to relieve cases of dyspnea, headaches, fever, fatigue), cancer, cases, cysts	Oral ingestion (drink, food)
Rhamnaceae	*Ziziphus lotus* (L.) Lam.	124	155	0.61	Fl, Fr, R	Infusion, poultices	Urological (kidney stones), anti-diabetic, digestive	Oral ingestion (drink), wash, topic

Plant part used: Wp:Whole Plant; L: Leave; Fl: Flowers; St: Steam; S: Seed; Fr: Fruit; Fr.sh: Fruit shells; Fr.p: Fruit peel; R: Root; B: Bulbe; Rz: Rhizome; T: Tuber; Lt: Latex; E: Ecorce; P: Pollen; Sw: Sapwood (the soft outer layers of recently formed wood between the heartwood and the bark, containing the functioning vascular tissue)

Use parts of medicinal plants

The leaves represent the most used part of medicinal plants, followed by leaves (28.8%), roots (22.2%), flowers (16%), stems (15%), seed (8%), rhizomes and ecorce (3%), bulb (2.4%), pollen (1.6%), latex, tuber and sapwood with 1% (Figure No. 4).

Modes of Preparation and administration

The decoction is declared by 36% of informants, infusion (24%), poultices (16%), raw (8.2%), powder (4.8%), powder mixed with oil of olive or honey (3.2%), maceration (3.2%), juice (2.6%) and essential oil (2%) (Figure No. 5).

The modes of administration reported in this study are in descending order, oral ingestion (drink or food) (81%), topical (11%), wound (2%), fumigation (2%), wash (1.8%), plaster (1.8%), wash (1.2%), ear drop (0.8%) and nasal (0.2%) (Figure No. 6). In Algeria most of the remedies based on medicinal plants are administered orally. In this result, the oral ingestion mode represents 81%.

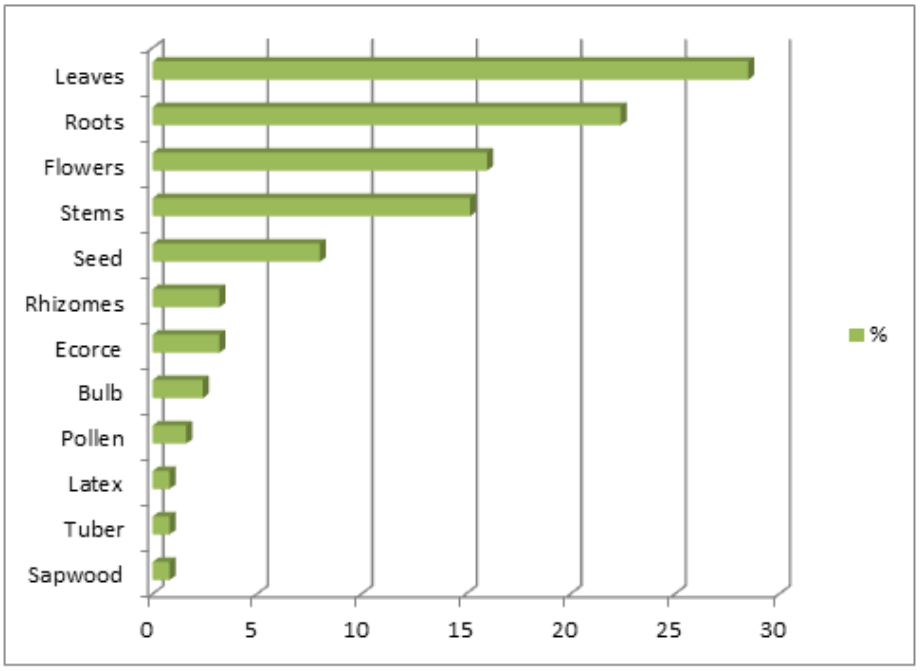

Figure No. 4
The frequency of use parts

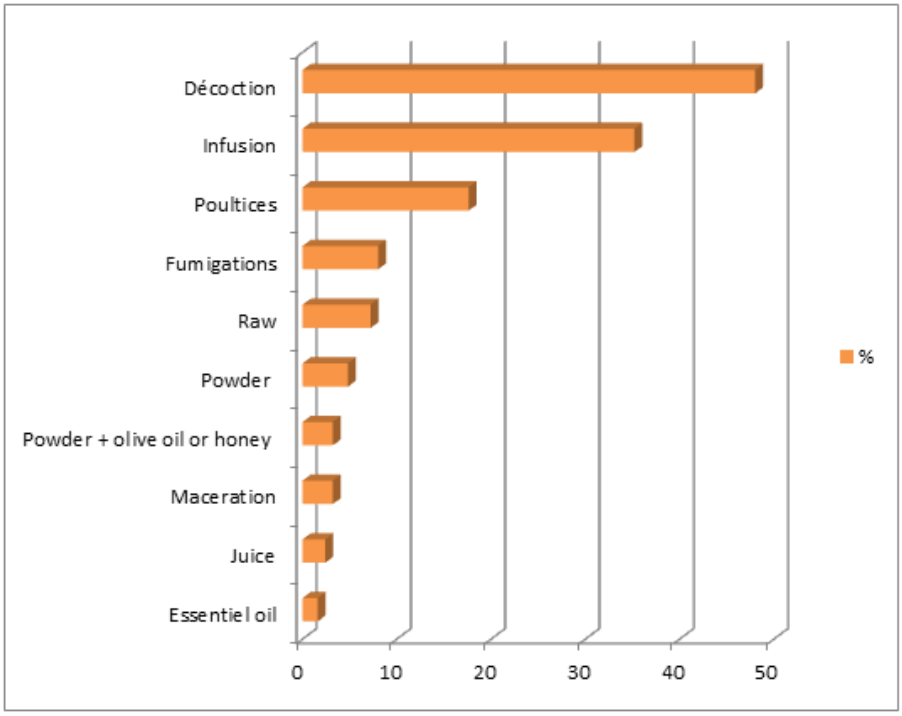

Figure No. 5
The frequency of modes of preparation

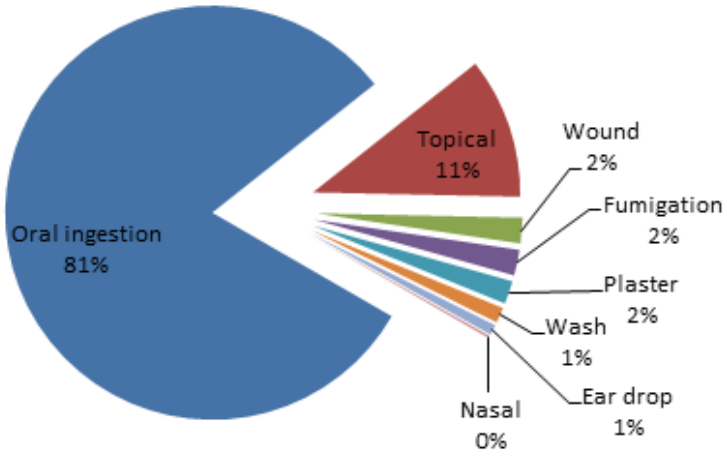

Figure No. 6
The frequency of methods of administration

Use report (UR) and use value (UV) and frequency of citation (FC)

The result of quantitative analyzing, namely, UV and UR revealed that the plant species most used in traditional medicine (Table No. 3 and Table No. 4) are *Thymus algeriensis* Bioss (Lamiaceae) with UR=197 and UV=0.82, followed by *Artemisia herba-alba* Asso (Asteraceae) with UR=191, UV=0.80, and *Eucalyptus camaldulensis* Dehnh (Myrtaceae) with UR=180, UV=0.70.

Concerning the frequency of citation, the most cited plant species, by decreasing FC, were *Artemisia herba-alba* Asso (Asteraceae) with FC=172, *Thymus algeriensis* (Lamiaceae) with FC=170 and *Rosmarinus officinalis* L (Lamiaceae) with FC=159.

Use reports, number of tax and Informant Consensus Factor (Fic) for each therapeutic use category

Figure No. 7 and Table No. 5, represent for each category, the number of reports of use and the number of species used. The analysis of the results obtained from calculating ICF shows that, digestive system category had the highest ICF (ICF=0.90) with 331 use-reports, then in descending order; respiratory system diseases (ICF=0.87 and 329 use-reports), skeleto-muscular system and rheumatism (ICF=0.86 and 149 use-reports), dermatological (ICF=0.86 and141 use-reports), Urological system (ICF=0.84 and 132 use-reports), nervous system, sound organs and other symptoms (ICF=0.78 and 53 use-reports), genital system and sterility (ICF=0.78 and 42 use-reports), cardiovascular and hematological system (ICF=0.76 and 69 use-reports), cases of cancer and cysts (ICF=0.65 and 27 use-reports) and coronavirus cases (Covid 19) (ICF=0.50 and 35 use-reports).

DISCUSSION

Through this ethnobotanical study that was carried out after the Coronavirus period, we noted a great demand for treatment with medicinal plants. WHO statistics showed that developed countries were the most affected with very high numbers of deaths. However, undeveloped and developing countries are the least affected, especially Arab countries. This explains why traditional medicine and the use of medicinal plants were very effective in preventing and treating Coronavirus disease. After the Coronavirus period, perceptions changed among many people. According to the result of Socio-demographic characteristics of the informants, we noticed that the informants who presented more information and more usage reports were the oldest (>60). Among older people, herbal medicine is part of their traditions and customs. These people have well preserved this heritage of their ancestors. The oldest constitute 29% of the informants, most of them are illiterate people who experienced the period of colonization where during this period education was not possible for everyone.

Table No. 5
Use reports, number of taxa and Informant Consensus Factor for each therapeutic use category

Category	N_t	N_{ur}	ICF
Digestive system (D, S)	33	331	0.90
Respiratory system (R, S)	43	329	0.87
Cardiovascular and hematological system (C, H, S)	17	69	0.76
Urological system (U, S)	21	132	0.84
Genital system and sterility (G, S, S)	10	42	0.78
Endocrine (diabetes, liver disorders) and immune system (E, I, S)	26	83	0.69
Dermatological (skin) (D)	20	141	0.86
Skeleto-muscular system and rheumatism (SK, M, R)	23	149	0.86
Nervous system, sound organs and other symptoms (N, S, S, O, S)	12	53	0.78
Cases of cancer and cysts (C, S, C)	10	27	0.65
Corona virus cases (Covid 19) (CO,V)	18	35	0.50

Legend: IFC=Informants' consensus factor; N_{ur}=Number of use-reports; N_t=Number of taxa;
IFC: 1=100% Consensus; 0.5-0.9 = High consensus; 0.1-0.4: Low consensus; 0: Absence of consensus (Disagreement)

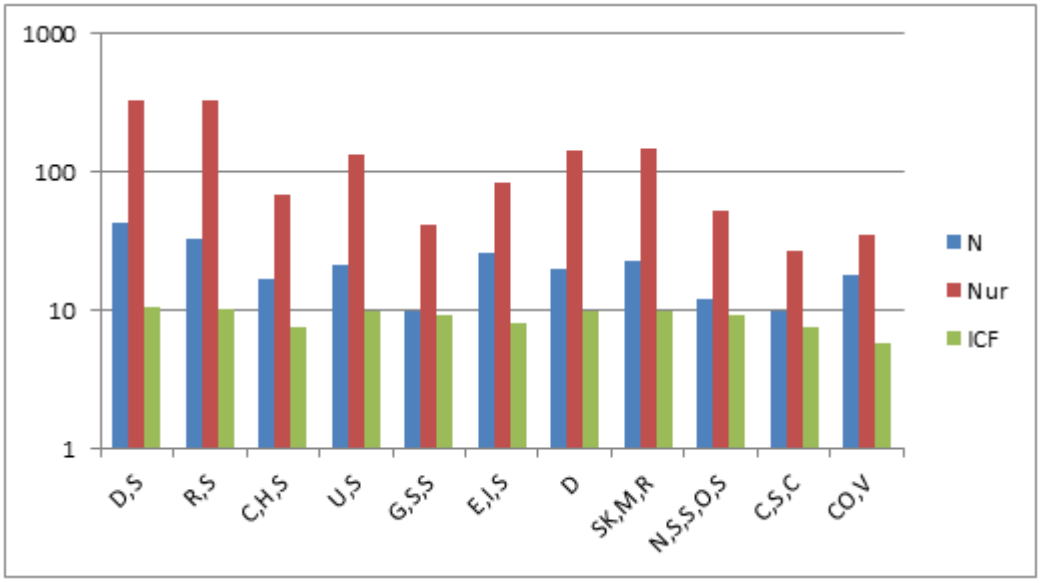

Figure No. 7
Informant consensus factor of diseases

Specific richness of the botanical families cited and the most cited species

The analysis of the results from the calculation of the frequencies of the families of medicinal plants used (Figure No. 2, Table No. 2), shows that the most represented families are Asteraceae (14%), Lamiaceae (13%) and Apiaceae (6.5%). These three families are always the first in the results of other works in Algeria, such as (Miara *et al*., 2018; Taibi *et al*., 2020). The same results were found by several authors (Sarri *et al*., 2014; Benarba, 2015; Sarri *et al*., 2015; Meddour & Meddour-Sahar, 2016). Also, Ramdane *et al*. (2015), found that Lamiaceae followed by Asteraceae were the most predominant families of medicinal species used by the Touareg called "blue men of the Sahara" in extreme South of Algeria.

Among these 121 species, there are 89 endemic species and 32 exotic species (Table No. 3). This number reflects the richness and floristic originality of Algeria that has attracted botanists for a long time such as Quézel & Sintès (1959) and Ozenda & Quézel (1956). The species most used by the population is *Thymus algeriensis* with UV=0.82 and 197 use reports. *T. algeriensis* is endemic to Algeria (Quezel & Santa, 1963). It is one of the most widely used species in folk medicine, to stimulate action in all functions of the body (Bruneton, 1993). *T. algeriensis* populations grow wildly on poor fertile calcareous soils and in different bioclimatic zones extending from the sub-humid to the lower arid (Ben El Hadj *et al*., 2012). The essential oil of this species is characterized by a very marked biological activity. The antimicrobial properties of the oil could be associated with the high percentage of linalool, which is known to possess strong antimicrobial activities (Pitarokili *et al*., 2002; Burt 2004). In addition, it has been well known that the phenolic components of the essential oils showed the stron-gest antimicrobial activity (Burt, 2004). The essential oil activity is then due either to minor constituents or a synergy between these and the major components (Zakarya *et al*., 1993). Thus, Benarba *et al.* (2015), mentioned that *Thymus vulgaris* was the most frequently used by local informants, with the highest UV of 0.883 (38 use reports). The two species *Thymus algeriensis* and *Thymus vulgaris* are characterized by thymol in their essential oils, this biomolecule active against bacteria, fungi and certain viruses.

The second medicinal plant cited in this work is *Artemisia herba alba* with a use value UV=0.80, and use reports UR=191. This species belongs to the botanical family Asteraceae which is the most cited family in the majority of ethnobotanical studies. *Artemisia herba alba* is an aromatic species very rich in secondary metabolites that can be used in traditional medicine (Maghni *et al*., 2016). *Artemesia herba alba*, known as "wormwood" is a perennial small shrub with pubescent leaves. The multiple biological activities of *Artemisia herba alba* essential

oil give it wide use in many foods, pharmaceutical, cosmetic and even medical fields (Maghni *et al*., 2024). This Asteraceae species grows in desert wadi beds in North Africa and South-West Europe. Other species of Artemisia, wormwood is an important source of biological compounds with biocidal and allelopathic activities (Chauhan *et al*., 2010). This aromatic species is widely used in North African's traditional medicine as expectorant, analgesic, antispasmodic, stomachic, vermifuge, diarrheic and sedative (Benmansour *et al*., 2015).

A. herba alba is characterized by very high genetic polymorphism (Maghni *et al*., 2016). This large variability within *A. herba alba* which could help investigation on a large collection of individuals and therefore select the most efficient ecotypes for re-introduction this species in highlands of Algeria and north of Africa. This speices present a great plasticity of adaptation, which allows it to occupy the three bioclimatic stages of Algeria. Thus, Maghni *et al*. (2023), showed that that we have two ecotypes of *A. herba alba* in Algeria: the first one has five flowers per capitulum and can be found at the level of the three bioclimatic floors studied, whereas the second one has eight flowers per capitulum occupying only the territories with a Saharan climate.

Eucalyptus camaldulensis Dehnh with UR=180, UV=0.70 and (FC=155). A leaf decoction of this species is drunk in the treatment of asthma, coughs, bronchitis and flu. According to Bellakhdar (1997), their powder is also administered against colds. A combination, in decoction, based on eucalyptus leaves, leafy stems of horehound, ammi umbel and cloves is recommended in cases of diabetes and constipation. This Australian plant was introduced into Algeria in 1857 to remediate marshy land and was planted over 30,000 ha (Oyen & Lemmens, 2002).

The next most used species is *Cinnamomum virum* (UR=173, UV=0.68, CF=153). In other studies this species is recommended to treat cases of thyroid (Taibi *et al*., 2020), Menstrual pain, respiratory and urinary infections (Bouasla & Bouasla, 2017), Diabetes (Telli *et al*., 2016) and menstruations (Ouelbani *et al*., 2016).

Rosmarinus officinalis L. (UR=170, UV=0.67, FC=159), wild plant, is found in all the villages of the study region. Rosemary is a multitasking aromatic plant. The leaves, in infusion or endecoction, are used against disorders of the digestive system (diarrhea), hepatic (gallbladder, cholesterol), respiratory (asthma), dermal (hair loss, edema, oily skin, wrinkles), nervous system (depression, memory, migraine, nervousness, sleep) and the osteoarticular system (sprain, rheumatism, sciatica) (Noureddine *et al*., 2020). The fresh leaves and compresses of the concentrated decoction are applied as a vulnerary and remedial agent for bruises, wounds and abscesses (Bellakhdar, 1997). The essential oil is neurotoxic given the presence of camphor in its composition. When inhaled, rosemary essential oil increased the ability to concentrate (Kahouadji, 1995). Finally, the buds are also used in gemmotherapy. It is a toxic plant (Jamila & Mostafa, 2014).

Parts used, modes of preparation and administration

The most used part of the plant is the leaf. This great demand for the use of leaves is due to their effectiveness. This effectiveness is explained by the fact that this organ of the plant is responsible for the production of different secondary metabolites such as trepans, alkaloids and flavonoids. These metabolites are responsible for the different biological, antibacterial, antiseptic and antifungal activities. At the leaf level, these metabolites are stored in the epidermal cells and secretion channels. This is possibly due to their richness with bioactive components (Adnan *et al*., 2014). The unsustainability of roots harvesting is well known by conservationists who labeled those used medicinal plants as highly threatened (Maroyi, 2013). Thus, Ngono Ngane *et al*. (2011), cited that this part of the plant is important because it is the seat of photosynthesis and sometimes the storage of secondary metabolites responsible for the biological properties of the plant. The removal of 50% of the leaves of a tree does not significantly affect its survival (Ouattara, 2006). The predominance of the use of leaves in herbal medicine by the Algerian population is cited by several authors. For example, the study of (Benarba *et al*., 2016) on 83 medicinal plant species showed that leaves were the plant parts mostly used (36%), followed by seeds (18%), aerial parts *(*17%) and roots (12%), fruit (5%), flower (5%), whole (5%) and bark (2%). The same result obtained by (Bouasla & Bouasla, 2017; Taibi *et al*., 2020). Also, in other countries such as Morocco (Barkaoui *et al*., 2017; Skalli *et al*., 2019), Italy (Leto *et al*., 2013). Compared to our results, a study carried out in the Harmel wilaya of M'sila, revealed that the plant parts used are classified in order of decreasing importance: seeds (38.10%), leaves (22.86%), roots

(18.10%), stems (7.62%), inflorescence (4.76%), whole plant (4.76%), and fruits (3.8%) (Bakiri *et al*., 2016). The informants in this study stated that the quantity of *Peganum harmala* seeds used in Algeria is 2 ounces (about 56.7 g) swallowed as is with a glass of water or mixed with honey or pounded with olive oil.

The preparation method that is very appreciated is the decoction followed by the infusion then poultice with respectively 36%, 24% and 16%. Other work in Algeria has reported the dominance of the two methods, decoction and infusion (Benarba *et al*., 2015; Belhouala & Benarba, 2021). The first is to immerse the parts of the plant in cold water, boil for 5 to 45 minutes, depending on the part of the plant used, then filter. The second is done mainly with the flowers and leaves of the plants; by pouring boiling water over the plant and letting it infuse for 10 to 20 minutes (Nogaret, 2003). Also, in South Africa (Olajuyigbe *et al.*, 2012) and in Morocco (Daoudi *et al*., 2015). Then, we have found that people in our region use olive oil and natural honey in many reports of medicinal plant use. Regarding the mode of administration, it is the mode of oral ingestion (drink or food) that had total dominance (81%), then Topical (11%). Our results agree with those obtained by (Benarba *et al*., 2014) with 80% and (Chermat & Gharzouli, 2015). Oral administration appears to be a rule which responds to the mode of treatment of the most frequent pathologies and seems to be the most effective. Except for the treatment of skin and rheumatic conditions, the traditional therapist in the steppe region of El Bayadh using plant drugs recommen ds the oral route (Boukerker, 2016).

Informant consensus factor (ICF)

The highest ICF value indicates cord selection of taxa among informants, while a low value indicates disagreement. ICF analysis has recently been used as an important tool for ethnobotanical data analysis. When the informant consensus factor is high, it reflects good knowledge of medicinal plants, collective knowledge of their uses, and also an exchange of information between traditional practitioners (Heinrich *et al.*, 1998). For our study, the degree of consensus of use (ICF) calculated is varying between 0.5 and 0.90 which explains a good knowledge of plants and an exchange of information between the respondents.

Regarding the informants' consensus factor, the highest FIC value was recorded for the Digestive disease category (FIC=0.90) with 331 usage reports mentioned by the informants and 33 medicinal species used. The second category is respiratory system diseases (ICF=0.87 and 329 use-reports) and 43 medicinal species used. This result agrees with that obtained for medicinal plants used in Jeddah, Saudi Arabia (digestive ICF=0.92 and respiratory ICF=0.89) (Alqethami *et al*., 2020). So, digestive and respiratory diseases were the conditions most treated with medicinal plants by the population studied. The number of species needed to treat these two categories of diseases is very high compared to other diseases. Thus, in terms of diseases treated in Oran (Algeria), digestive disorders occupy first place (50%), followed by respiratory diseases (28%) (Benaiche *et al*., 2019). All of the ICFs determined in this study are >0.5. These high ICF values indicated reasonable informant reliability on plant species use (Lin *et al*., 2002). Informant consensus values also indicated that the informants shared knowledge of the most important medicinal plant species for treating the diseases most frequently encountered in the study region. Therefore, species with high ICF should be prioritized for further pharmacological and phytochemical studies (Njoroge & Bussmann, 2006).

The addition of a phytotherapeutic treatment then reinforces the effectiveness of the remedy. chemical, or reduces its side effects. Often, it is also possible to adapt the dosages of this chemical remedy once associated with herbal treatment. Likewise, phytotherapy makes it possible to replace synthetic molecules when they are no longer tolerated or accepted by the patient. For example, the case of anti-inflammatories, antidepressants, or even anxiolytics (Chabrier, 2010), it is estimated that 10 to 20% of hospitalizations are due to side effects of chemical drugs (Iserin, 2001). Phytotherapy offers very comprehensive possibilities that very often chemotherapy conventional cannot equal, since we can also restore the great physiological (neuroendocrine, immune) that act on functions and therefore intervene device by device (musculoskeletal, cardiovascular, etc.). It is also possible to have a specific therapeutic action on each organ of the body, in a precise and targeted manner to each plant used (Chabrier, 2010).

Plants used against the corona virus

People, based on the symptoms of corona cases to choose the plants that may be effective against the virus. The main targeted symptoms are fever, the difficulty of breathing (reduction in oxygen levels in the patient), fatigue and headache. So, they have

chosen the medicinal plants already used to exceed their symptoms. Indeed, the plants used (17 species) are *Ajuga iva* lshieb (L.) Shreb, *Allium cepa* L, *Allium sativum* L, *Artemisia absinthium* L, *Cinnamomum zeylanicum, Artemisia herba-alba* Asso, *Curcuma longa, Eucalyptus camaldulensis* Dehnh, *Foeniculum vulgare* Mill, *Thymus algeriensis, Zingiber officinale* Roscoe, *Syzygium aromaticum, Salvia officinalis* L, *Rosmarinus officinalis* L, *Juniperus phoenica, Lavandula stoechas* L and *Mentha piperita* L.

As soon as the first suspicious symptoms of coronavirus appear, locals begin to purify the air in their homes by fumigating with leaves of *A. herba-alba, A. absinthium, Juniperus phoenica, Rosmarinus officinalis, Eucalyptus camaldulensis, Thymus algeriensis,* or fumigation of the flowering tops of *Lavandula stoechas*. In case of cough, they proceed to the decoction of *Allium cepa*, of *Allium sativum* or of the bark (Ecorce) of *Cinnamomum zeylanicum* and the leaves of *A. herba-alba*. Thus, the infusion of the Rhizomes of *Zingiber officinale* or else, they mix the powder of the rhizomes of *Curcuma longa* with olive oil, honey or milk. In case of dyspnea the patient inhales the fumigation of the leaves of *Mentha piperita, Juniperus phoenica, Thymus algeriensis* or even of the flower buds of *Syzygium aromaticum* and the rhizomes of *Zingiber officinale.*

These medicinal plants used by the local population of the Algerian highlands in the prevention and fight against coronavirus infection, could constitute an important source of information that can be exploited by scientific research in the fields of phytochemistry aimed at identifying new active molecules against coronavirus.

Toxic medicinal plants

Regarding the toxicity of certain medicinal plants, informants do not have sufficient knowledge. They declared only six species (*Aristolochia Paucinervis* Pomel., *Nerium oleander* L, *Atriplex halimus* L, *Thapsia garganica* L, *Peganum harmala* L and *Ecballium elaterium* L.). They use these plants with great caution. The best method is to mix the powder of the toxic plant with the original honey and take a small quantity (shape of a wheat seed). This method of preparation and administration of these toxic plants reflects the experience and good knowledge of the informants to avoid toxicity due to taking high doses of these species. The informants reported that these toxic plants are generally used to treat cases of cancers and cysts. All these toxic medicinal plant species are cited by Guechi (2022). This author noted that the toxic medicinal plants cited by the informants are: *Urtica urens* L. with 24 citations and a rate of 29% followed by *Thapsia garganica* L. (16 citations, 19%), *Ecballium elaterium* (L.) A. Rich. Comes in 3rd position with 14 citations and 17%. Informants also cited *Nerium oleander* L. (10 responses, 12%), *Ferula communis* L. (8 responses, 10%), *Citrullus colocynthis* (L.) Schrad. (5 citations, 6%) and *Peganum harmala* L. (2 responses, 2%). *Artemisia herba-alba* Asso, *Aristolochia longa* L., *Lycium halimifolium* Mill., *Glycyrrhiza glabra* L. and *Hypericum perforatum* L. Other toxic medicinal plants cited in this work and not declared by the informants as toxic are; *Artemisia herba-alba* Asso, *Echinops spinosus* L., *Juniperus phoenicea* L., *Lepidium sativum* L., *Pistacia lentiscus* L., *Rosmarinus officinalis* L., *Thymelaea microphylla* Coss. et Dur. All these plants considered as toxic at higher doses and are not recommended to pregnant women (Hammiche *et al*., 2013). Also, *Euphorbia cornuta* Pers (Chehma, 2006), *Carlina gummifera* (L.) Less (Bouzidi *et al*., 2002), and autres, *Ajuga iva* (L.) Schreb, *Cinnamomum virum* J. Presl, *Curcuma longa* L, *Glycyrrhiza glabra* L., *Laurus nobilis* L., *Marrubium vulgare* L., *Urtica dioica* L. and *Ricinus communis* L.

The last 15 years have shown that herbal medicine is not without risk. Toxic effects affect most organs. We can cite renal failure linked to Chinese plants, cardiac effects due to aconite poisoning or pulmonary effects linked to certain mints (Larrey, 1997; Peyrin-Biroulet *et al*., 2004). But it is certainly the liver effects that are the most significant (Larrey *et al*., 1992; Larrey, 1997). In Morocco, plant poisonings represent 5.1% of all poisonings outside of scorpion stings and envenomation, of which the top three plants sources of plant poisoning are *Atractylis gummifera* (10.1%), *Cannabis sativa* (4.6%) and *Peganum harmala* (3.6%) (Kamgoui, 2004).

According to Izzo *et al*. (2016). It should be noted that traditional medicines are not always free of side effects due to the presence of various pharmacological substances which may induce problems through inappropriate dosage and method of administration. Concerning *Thapsia garganica* L. Hammiche *et al.* (2013), it showed that is a poisonous plant rich with histamine-releasing substances such as lactones sesquiterpenes (thapsigargine and thapsigarginine). Exposure to its molecules might induce vomiting, violent diarrhea, digestive mucous

inflammation, salivary secretion, nervous disorders and gastroenteritis which leads lastly to death. On the skin, the juice of the plant and the root can lead to deep ulcerations (Bellakhdar, 1997). Thene, the two species *Aristolochia longa* L and *Ecballium elaterium* L are among the most used plants in Algeria to treat Cancer (Taibi *et al*., 2020). Cucurbitacines and glycosides present in *Ecballium elaterium* L. might cause severe cutaneous and digestive adverse reactions that should not be ignored (De Smet, 1997; Raikhlin-Eisenkraft & Bentur, 2000). The plant is toxic, especially the fruit. fruit juice is irritating to the skin and eyes (Narimene, 2022). The plant is toxic and can cause vomiting, internal bleeding, liver and cardiovascular problems (Delaveau *et al*., 1977; Souilah *et al.*, 2020). *Aristolochia longa* L, it contains a highly toxic and carcinogenic substance (Narimene, 2022). *Peganum harmala* L, used over a certain period of time, causes irreversible kidney damage with hematuria as well as paralysis of the limbs. (Charnot & Faure, 1945). *Peganum harmala* L, contains alkaloids (harmine, harmane, harmaline, harmalol, harmol) which are responsible for the toxicity (Hammiche *et al*., 2013). These alkaloids have a cardiovascular action (hypotension, arrhythmia, oxytocic and anthelmintic bradycardia (Paris & Moyse, 1976 -1981). All parts of *Nerium oleander* L are poisonous. It causes weakness, vomiting, convulsions, diarrhea, etc. in humans. More than 10 leaves are fatal for an adult (Hmamouchi, 1999). Signs of poisoning: unconsciousness, irritation of mucous membranes, nausea, vomiting, abdominal pain, diarrhea, serious heart problems and skin burning sometimes reported in subjects sensitive (Bruneton, 1993; Bellakhdar, 1997). At *Urtica urens* L, the stinging hairs that cover the stem, leaves and flowers produce a painful stinging sensation (Narimene, 2022). The stinging hairs of the nettle contain acetylcholine, histamine and 5-hydroxy-tryptamine (serotonin), a small amount of leukotrienes (Ghedira *et al.*, 2009). The burning sensation effect of skin is due to the presence of formic acid (Flury, 1927; Draghi, 2005).

CONCLUSION

Through this study, a series of ethnobotanical surveys is carried out in one of the towns of the highlands of Algeria (Tiaret). Thanks to the participation of 313 informants, it is possible to make a very detailed inventory of the medicinal plants used by the inhabitants of the region studied. Thus, to bring together the different information and knowledge of the informants concerning the therapeutic uses practiced.

A very high agreement of our results with those obtained by the majority of studies carried out on medicinal plants in Algeria, which gives more credibility and reliability of the ethnobotanical information presented to readers, scientists and researchers.

Most of the medicinal plants in our region are found in unfavorable ecological conditions which can lead to their ratification or even their disappearance. So, it is necessary and urgent to preserve this plant heritage and to put in place strategists and programs of rehabilitation and restoration of spaces occupied by these medicinal plants. It is very important to develop awareness among rural populations and involve them in the various medicinal plant protection programs.

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