



ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS USED IN THE REGION OF MIDDLE OUM RBIA (MOROCCO)

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Abstract

In order to enhance the heritage of the medicinal plants used in the traditional pharmacopoeia in the Middle Oum Rbia region. We carried out an ethnobotanical study of medicinal plants, which was based on a survey of 1360 people from different population groups, broken down by sex, age, grade, family status and chosen medicine, randomly selected from 34 strata that are answered by questionnaire form. The analysis of the data collected shows that 69% of respondents combine modern medicine and traditional medicine, 19% practice traditional medicine and 12% use modern medicine, 58% of respondents who use medicinal plants are women. The floristic analysis of the data made it possible to identify 74 families, 198 genera and 238 species of which *Origanum compactum*, *Trigonella foenum graecum* and *Chenopodium ambrosioides* are the most used species. Asteraceae, Lamiaceae, Fabaceae, Apiaceae, Poaceae, Rosaceae and Brassicaceae are the richest families of species exploited for therapeutic purposes. The part of the plant most used is the leaf and the most common methods of preparation are infusion and decoction. In addition, it is the digestive, respiratory and dermatological disorders that are most treated by medicinal plants; However, most users of medicinal plants are not aware of the need to respect the dose and toxicity potential of these plants. In addition, some respondents reported the toxicity of certain plants, namely: *Chenopodium ambrosioides*, *Catharanthus roseus*, *Nerium oleander*, *Atractylis gummifera*.

This work can be a source of information for phytochemists and pharmacologists interested in research on medicinal plants. In addition, the valuation of medicinal plants is a socio-economic benefit.

Keywords : Morocco, Middle Oum Rbia, medicinal plant, ethnobotanical survey.

Introduction

Man has gradually become aware of the possibility of curing his illnesses by plants. It is a knowledge that has developed over millennia. Herbal medicine varies according to the local flora; Specific herbal preparations have been used to control diseases in humans and livestock (Waller *et al.*, 2001). Afterwards, the development of commercial relations has favored the exchange of the most famous medicinal plants as well as therapeutic knowledge.

Most of the world's population still depends on traditional medicine and therefore on the use of plants and plant extracts; 2.2 billion people in the world are still

living in poverty according to the UNDP report in 2014 and rely almost exclusively on herbal medicine. On the other hand, in industrialized countries where problems of resistance have emerged as a result of over-consumption of drugs, alternatives to modern medicine are being sought (Akerele, 1988).

The increased use of medicinal plants worldwide is a threat to their long-term survival. Many plants are threatened with extinction or severe genetic impoverishment (Hamilton, 2004). It is then necessary to implement a strategy of valorization and sustainable development of the entire aromatic and medicinal plants sector, while involving the people concerned and taking

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them into consideration in any awareness program.

Morocco has a rich plant heritage because of its richness and diversity. Among these natural resources, aromatic and medicinal plants (MAP) play a large role and play a large role in the national economy (Bellakhdar, 1997). Morocco is among the top five floristically richest countries in the Mediterranean basin and is a traditional supplier of the world market in aromatic and medicinal plants (Quezel and Medail, 1994).

The Middle Oum Rbai region, due to its geographical position and climatic context, offers significant ecological and floristic diversity. Therefore, a phytotherapeutic tradition is strongly rooted in this region. It is in this perspective that we conducted an ethnobotanical study in the region of Middle Oum Rbai, in order to establish the inventory of medicinal plants used by the local population for the medication, to collect information concerning the therapeutic uses that are practiced there, in particular the modes of use and administration and finally to clear the principal affections treated by these plants.

Presentation of the study area

Field of study :

Geographical location of the study area

The region of Middle Oum Rbai includes the provinces of Khouribga, Fkih Ben Saleh and Kasbat Tadla, it is part of the region of Beni Mellal-Khénifra created by the territorial division of 2015 and it is located in the northern part of the country. The region of Beni Mellal-Khénifra includes five provinces: Blessed Mellal, Azilal, Fkih Ben Saleh, Khenifra, Khouribga. It covers an area of 28,374 Km² or 3.99% of the national territory.

The Beni Mellal-Khénifra region is bounded on the west by the Casablanca Settat and Marrakesh-Safi regions, on the south by the Draa Tafilalet region and on the east by the Eastern region and on the north by the Fes Meknes and Rabat Sale Kenitra (Fig.1).

The population

According to the 2014 General Population and Housing Census (RGPH), the Beni Mellal-Khénifra region has 2,520,776 inhabitants of which 49.14% in urban areas, which is lower than the national rate (60,36%). The density is 88.8 inhabitants per km².

Climate and precipitation

The geographical position of the region of Beni Mellal-Khénifra, confers a climatic diversity which varies from a humid climate (tops of the chain of High Atlas and some peaks of the middle Atlas) to a semi-arid climate below the mountainous mass passing through the sub-humid (Ministry of the Interior, 2015).

The dominant climate is of continental type: intense cold in winter with very hot summers. In addition, the average annual rainfall varies considerably. In 2012, the province of Beni Mellal recorded a rainfall of 291 mm, while in 2008; it was of the order of 460.3 mm. This



Fig. 1 : Map of Provinces of the Beni Mellal-Khénifra Region (Ministry of the Interior, 2015).

rainfall showing significant variations from year to year is often poorly distributed throughout the year. The high concentrations of rainfall during a given period are sometimes the cause of certain disasters such as floods, land subsidence and collapse of old buildings. The province of Azilal, meanwhile, records an average rainfall of 450 mm with significant snowfall, which contributes to the improvement of the water volumes of the reservoirs. While Khouribga and Kasba Tadla record respectively 278 mm and 334 mm. Mean annual temperatures vary between highs of 40°C in the province of Beni-Mellal and minimum of 2°C in the province of Azilal. The snow appears from 900 m of altitude and the prevailing wind is the Chergui during the summer period (Ministry of the interior, 2015).

Material and methods

Choice of the region

The present ethnobotanical and floristic research concerns the region of Middle Oum Rbia whose choice was based on the phytogeographic subdivision of Morocco de Sauvage and Vindt (1961); it is the X subdivision (Middle Oum Rbia) which has not been the subject of any study of this kind to our knowledge.

Choice of ethnobotany survey points

The determination of the survey points is based on the stratified sampling technique (Daget and Godron, 1982). We then determined 34 strata, with a staff of 40 people per stratum. The study involved a total sample of 1360 people (Fig. 2).

We identified 34 strata (Table 1.), of which we conducted our ethnobotanical survey in the study area on a sample of 1360 people, with a total of 40 people per stratum.

Ethnobotanical survey

The ethnobotanical survey, conducted in the Oum Rbia region, between 2010 and 2015, was based on random sampling; according to the probabilistic stratified sampling technique (Godron, 1971 and 1982). The survey therefore consists of interviewing people from different categories within the stratum. People are skeptical at first

and refuse to answer our questions but once we put them in trust by explaining the objectives of the study, they collaborate sympathetically. The ethnobotanical survey form was filled out with 1360 people from different profiles. The pre-established questionnaire first includes questions relating to the profile of the informant: Age, intellectual level, family situation, chosen medicine and then questions about each of the medicinal plants used: vernacular name of the plant, part used, dose used, the method of preparation and use and the disease treated. The plants indicated by the population were collected in order to identify them. The identification and identification of the different species were made at the level of Laboratory of Nutrition, Health and Environment at the Kenitra Faculty of Science based on the following works:

- New flora of Algeria and the southern desert regions of Quezel & Santana (1962, 1963), volumes I and II.
- Practical flora of Morocco by Fennane *et al.*, (1999, 2007), Volume 1, 2 and 3.
- The medicinal plants of Morocco of Sijelmassi (1993).
- The traditional Moroccan pharmacopoeia of Bellakhdar (1997).
- Moroccan medicinal and aromatic plants of both the informant profile and the floristic data.

Results and discussion

Distribution of the sample according to the chosen medicine

69% of respondents combine modern medicine and traditional medicine for treatment, 19% practice traditional medicine and 12% use modern medicine only (Fig. 3).

Traditional medicine

To better evaluate the importance of traditional medicine, we will consider the number of respondents who use traditional medicine and that of people who combine the two medicines (modern and traditional), the whole constitutes a staff of 1200 people. This is a considerable number compared to the total number of 1360 surveyed. However, the number of people who combine the two medicines (78%) far exceeds that of people who only care for plants (22%).

Table 1: Different survey points at the study region level.

1. Khouribga	8. Oued zem	15. Bejaad	22. Fkih ben saleh	29. Kasbat tadla
2. Hattane	9. Tacharaft	16. Tlet chougrane	23. Bni oukil	30. Ouled youssef
3. Boujniba	10. Beni smir	17. Rouached	24. had bradia	31. Oulad said
4. Bni yekhlef	11. Oulad fennane	18. Had boukhriss	25. Ouled nemma/souk sebt	32. Guetaya
5. El foqra	12. Ait ammar	19. Had bni batou	26. Ouled zemam	33. Semgaya
6. Lagfaf	13. Oulad boughadi	20. Bni zrentel	27. Ouled zidouh.	34. Arbat m'adna

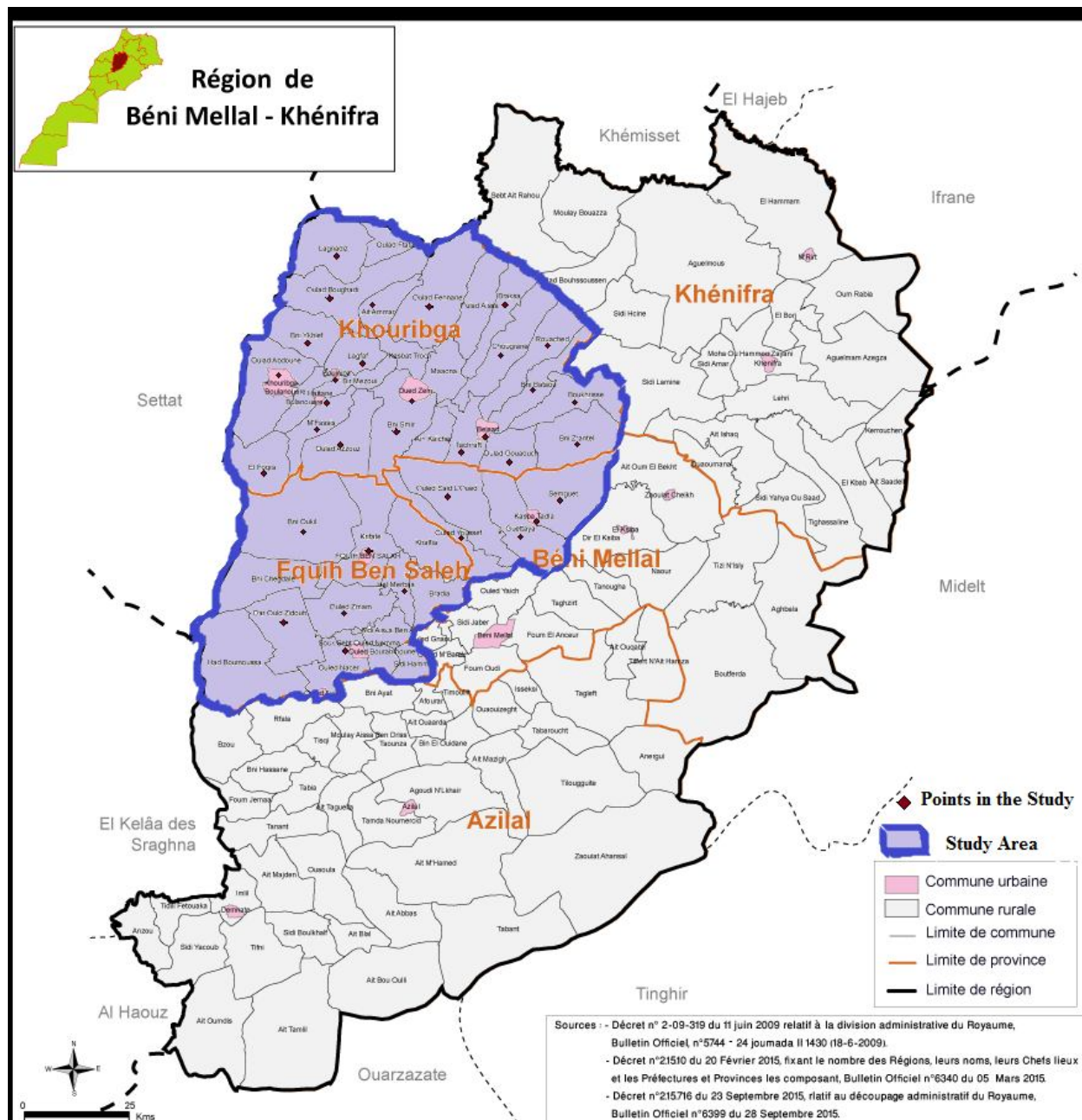


Fig. 2 : Map of distribution of survey points in the Study Area (Ministry of the interior, 2015, modified).

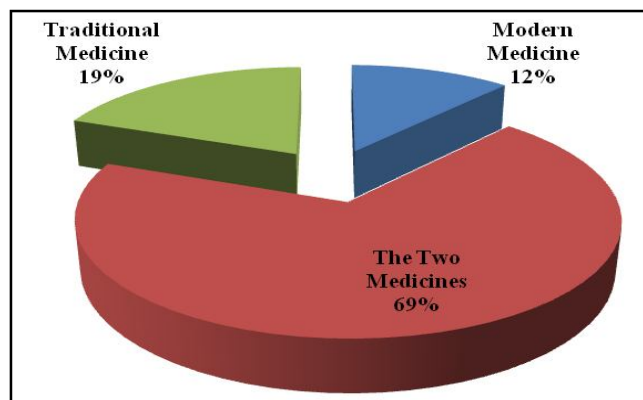


Fig. 3 : Distribution of the sample according to the chosen medicine in the region of Middle Oum Rbai.

Distribution of the sample by gender

The results show that 58% of respondents in the study area who use medicinal plants for treatment are women and 42% are men. The Moroccan woman holds the traditional knowledge and takes care of the medication of the members of the family especially for the small health inconveniences. These results are consistent with those of other ethnobotanical studies at the national level namely Benknigui *et al.*, (2011); El Hilah *et al.*, (2016).

People aged 30 to 50 use medicinal plants in a proportion of 58%, followed by people over the age of 50 with 23%. While people under 30 represent only 19%. It

is therefore people over the age of 30 who are most involved in medicinal herb medication. This is explained by the fact that the age group [30-50] is made up of the most active people in society and who assume responsibility in the family and by the fact that the age group 50 and over, represents a category of people potentially in need of chronic medication. Similar results were presented by El Hafiane at the Prefecture of Agadir-Ida-Outanane in 2014.

Sample distribution by level of study

36% of those practicing traditional medicine are illiterate, those with secondary and primary education represent respectively 23% and 22%, 12% have a college level and 7% of academics. 36% of those practicing traditional medicine are illiterate, those with secondary Rhizome, St: Stem, Se: Seed, Re: Resin, Bu: Bulb, H: Oil, PA: Aerial part, WP: Whole plant; Diseases treated: Der: Dermatological, GU: Genitourinary, Tra: Traumatological, Gg: Digestive, BD: Oral/Dental, CV: Cardiovascular, Oph: Ophthalmological, Neu: Neurological, Res: Respiratory, He: Hepatic, Met : Metabolic IM: Immune.

Distribution of the sample by family situation

69% of married people use traditional medicine, while singles represent only 27%, widowers 3% and divorced 1%. The Married people are usually looking for inexpensive and effective solutions for caring for family and children. These results are consistent with the findings of other studies including those of Rhattas *et al.*, (2016).

The effectiveness of traditional medicine

66% of users of medicinal plants reported that they have seen a significant (effective) improvement after the use of the plants, 33.6% of respondents say that herbal recipes are very effective (healing), while only 0.3% said that plants are ineffective.

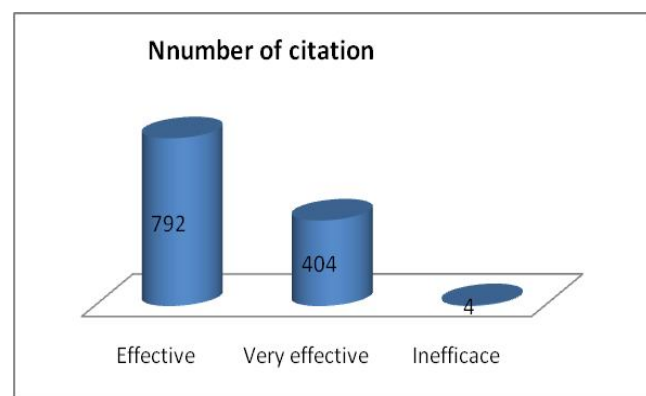


Fig. 4 : Distribution of respondents according to the degree of effectiveness of herbal medicine in the region of Oum Rbai.

Part of the medicinal plant used

The results obtained show that the leaf is the part of the plant most used with 495 citations, followed by the seed with 250 citations, the fruit and the aerial part with 118 and 125 citations respectively. The vegetative and reproductive organs of the plant occupy the first ranks. The rhizomes come next with 111 citations and the flower comes with 88 citations only. The leaf remains the most frequently used part in the study area; which is consistent with the results of Rhattas *et al.* (2016) and Benlamdini *et al.* (2017).

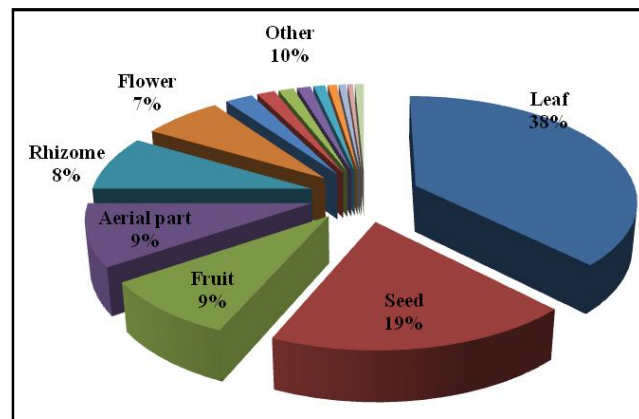


Fig. 5 : Percentage according to the part of the medicinal plant used in the region of Middle Oum Rbai according to the number of citations.

Medicinal plants most used in the study area

The floristic analysis of the plants indicated by the local population as medicinal plants made it possible to identify 74 families and 238 species (Table 2.) The results show that the frequency of use of different medicinal plants varies from one species to another; The fig. below shows the most commonly used medicinal plants in the Middle Oum Rbai region. *Origanum compactum* ranks first with 100 citations, *Trigonella foenum graecum* (39), *Chenopodium ambrosioides* (33), *Verbena officinalis*

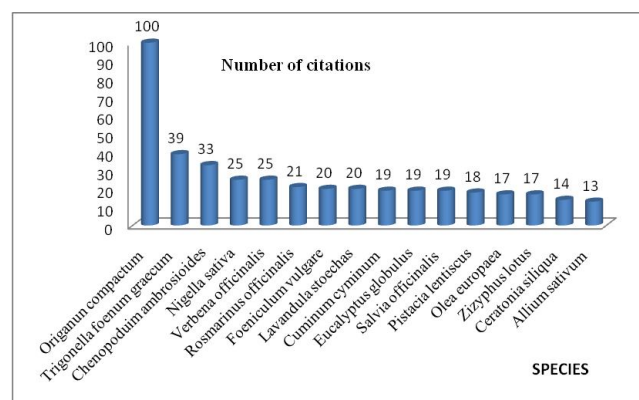


Fig. 6 : Frequency of the most used species in the region of Middle Oum Rbai

(25), *Nigella sativa* (23), *Foeniculum vulgare* (20), *Salvia officinalis* (19), *Olea europaea* (17), *Zizyphus Rosmarinus officinalis* (19), *Lavandula stoechas* (19), *lotus* (17), *Pistacia lentiscus* (15), *Ceratonia siliqua Cuminum cyminum* (19), *Eucalyptus globulus* (19), (13), *Artemesia herba alba* (13) (Fig.6).

Table 2. : Table of the Catalog of Medicinal Plants Developed in the Middle Oum Rbia.

Used parts: Le: Leaf, Fr: Fruit, Fl: Flower, Rh: Rhizome, St: Stem, Se: Seed, Re: Resin, Bu: Bulb, H: Oil, PA: Aerial part, WP: Whole plant; **Diseases treated:** Der: Dermatological, GU: Genitourinary, Tra: Traumatological, Gg: Digestive, BD: Oral/Dental, CV: Cardiovascular, Oph: Ophthalmological, Neu: Neurological, Res: Respiratory, He: Hepatic, Met : Metabolic IM: Immune.

Family	Scientific name	Vernacular name	Used part	Diseases treated	Number of citation
<i>Adoxaceae</i>	<i>Sambucus nigra</i>	Borwabez/ouijjane	WP,Fl	GU,Res,Der,He,	5
<i>Agavaceae</i>	<i>Agave americana</i>	Sabra	Le	Der, Res,Dg	5
<i>Amaranthaceae</i>	<i>Beta vulgaris</i>	Selk/Barba	Bu,	CV, Der, Dg, GU,Tra	2
	<i>Chenopodium ambrosioides</i>	Lamkhenza	Le,WP	Dg,Neu,Res,ORL,	33
	<i>Pistacia lentiscus</i>	Droo/titkt	Re,WP,Ec,Se,Fr	Dg,Neu,CV,Der, GU	15
	<i>Salsola kali</i>	Laâssla	WP	GU,Dg	3
	<i>Spinacia oleracea</i>	Pinard/sabanikh	Le	Res	1
<i>Amaryllidaceae</i>	<i>Allium cepa</i>	Basla hamra	Bu,Se	Neu,Res	2
	<i>Allium porrum</i>	Korrat	Bu	Res	1
	<i>Allium sativum</i>	Thouma	Bu,PE	Met, IM, Res, CV, Neu, Dg, Der, GU	12
<i>Anacardiaceae</i>	<i>Pistacia atlantica</i>	Lebtem/ laqwawech	Re,Le,	Der,GU,Dg,Tra	7
	<i>Rhus pentaphylla</i>	Tizra/semak	Le,Se	Dg,GU,Der	3
<i>Apiaceae</i>	<i>Ammi majus</i>	Tlilan/trilan	Le	Der	1
	<i>Ammodaucus leucotrichus</i>	Kamon souffi	Se	Dg,RES,Neu,	9
	<i>Anethum graveolens</i>	Elkarwiya elaâmya	Se	GU	1
	<i>Apium graveolens</i>	Krafess	Rh,PE,	Tra,Res,Der,	4
	<i>Carum carvi</i>	ELKarwiya	Se	Dg,Met,Neu,ORL, GU,	8
	<i>Coriandrum sativum</i>	Kazbour	WP,Le,Se,	Res,Der,Tra,Dg, GU, Met	8
	<i>Cuminum cyminum</i>	Kamoun	Se	Dg,Neu,Res, GU, Met	19
	<i>Daucus carota</i>	Zerâit khizo	Se	Dg	1
	<i>Eryngium ilicifolium</i>	Choukt lyahoud	Le	Der	1
	<i>Eryngium triquetrum</i>	Mghezla	Rh	Der	1
	<i>Ferula communis</i>	ELklekh/klikha	Rh,Fr,PE	Der, GU, Met, Neu	3
	<i>Foeniculum vulgare</i>	Nafeaa/basbass	WP,Se,H	Dg,Met,Neu, GU, Met, Res, CV, Der	20
	<i>Kundmannia sicula</i>	Ziyatta	Le,WP	GU, Tra	2
	<i>Petroselinum sativum</i>	Maadnouss	Se,PE	CV,Dg,Re, GU, Met	10
	<i>Pimpinella anisum</i>	Habat hlawa	Se	Res, CV, Dg, GU	8
	<i>Ridolfia segetum</i>	Tebch	Fl,Le,PE	Neu,Dg,He	4
	<i>Thapsia garganica</i>	Deryass	St	Der	1
<i>Apocynaceae</i>	<i>Caralluma europaea</i>	Darmouss	PE	GU, Met,	8
	<i>Catharanthus roseus</i>	Elfenka/elwenka	WP,Le,	CV,BD,Der,	3
	<i>Nerium oleander</i>	Defla	Fr,Fl	Met,Der, Tra	2
<i>Araliaceae</i>	<i>Panax ginseng</i>	Gensinrh	Rh	Dg, GU,	1
<i>Arecaceae/ Palmaceae</i>	<i>Chamaerops humilis</i>	Doum	Fr	He,Dg	1
<i>Aristolochiaceae</i>	<i>Aristolochia longa</i>	Bertzoum	Se,PE	CV,Neu	1
<i>Asparagaceae</i>	<i>Asparagus officinalis</i>	Sakoum/helion	Se,WP,Rh	GU, Oph, Dg	3
	<i>Urginea maritima</i>	Laanssal	B	He, CV,	4
	<i>Achillea ageratum</i>	Tarhella/karman	PE	Dg, Res	1

<i>Asteraceae</i>	<i>Achillea santolinoides</i>	Chwihya	WP	Der	1
	<i>Anacyclus clavatus</i>	Alkhowane	Fl	GU	1
	<i>Argyranthemum frutescens</i>	Chajarat maryam	Le	GU	1
	<i>Artemisia absinthium</i>	Chiba/lhalhal	Le,WP	Dg,GU,BD,Tra,	11
	<i>Artemisia herba- alba</i>	Chih	WP,Le	GU,Dg,Res,Met	13
	<i>Atractylis cancellata</i>	Njema	Fl	Dg	1
	<i>Atractylis gummifera</i>	Chouk laâlak/addad	St,Rh,Le,	Neu,Der,GU,	8
	<i>Bellis perennis</i>	Zahrat rabia	WP	He,Dg	1
	<i>Centaurea chamaerhaponticum</i>	Tavra	Rh,St	Dg,He	4
	<i>Centaurea Maroccana</i>	Baaj nahl/sefraj	Le,WP	Der,Neu,Dg,GU	3
	<i>Chrysanthemum coronarium</i>	Rjil djaja	WP,Le	Dg	2
	<i>Chrysanthemum segetum</i>	Lokhowan	Fl,WP	Dg,Tra,Neu	2
	<i>Cichorium intybus</i>	Buagad	WP,Le	CV,Dg,Res,He	4
	<i>Cynara cardunculus</i>	Kherchef lbaldi	WP,Rh	Met,Dg,CV,	4
	<i>Cynara scolymus</i>	Elqoq	PE	CV/Dg	1
	<i>Echinops spinosus</i>	Taskra	St,Rh,LeWP,	Res,Dg,GU,Neu	10
	<i>Inula viscosa</i>	Trahla/ terhla	Le	Dg	1
	<i>Lapsana communis</i>	Achichat tady	WP	Der	1
	<i>Matricaria chamomilla</i>	Babonj/kamoumi	WP,Fl,	He,Neu,Der,Dg,Tra, GU	13
	<i>Scolymus hispanicus</i>	Lgornina	WP,LateX,St	Der	1
<i>Berberidaceae</i>	<i>Senecio vulgaris</i>	Chikh erbia	Le	GU	1
	<i>Silybum marianum</i>	Chouk lahmar	PE	CV	1
	<i>Sonchus oleraceus</i>	El hindiba barri	Rh,WP,Fl	Dg,GU,CV,Der,He	4
<i>Berberidaceae</i>	<i>Berberis buxifolia</i>	Oud rih	Rh	GU	1
	<i>Berberis hispanica</i>	Arhriss			1
	<i>Berberis vulgaris</i>	Bosman	Fr,Le,Ec,WP	Der,Res,Dg,GU	5
<i>Betulaceae</i>	<i>Corylus avellana</i>	Bondok	Se	Dg,CV,Neu,	2
<i>Borraginaceae</i>	<i>Borago officinalis</i>	Lessan laard	WP,Le,	GU,Res,	3
	<i>Echium plantagineum</i>	Lessan tyr/adrar/ lessan lbagra	Le	Tra	1
<i>Brassicaceae</i>	<i>Anastatica hierochuntica</i>	Elkamcha	Le	Dg	1
	<i>Brassica nigra</i>	Elkhardel	Se	Dg,Der,Neu	2
	<i>Brassica oleracea</i>	Malfouf	Le	Dg	1
	<i>Capsella bursa-pastoris</i>	Kiss raii	WP	MetDg	2
	<i>Diplotaxis harra</i>	El harra /charyatt	Le	Der,CV,	3
	<i>Lepidium sativum</i>	Hab rchad	Se	CV,Dg,	4
	<i>Nasturtium officinale</i>	Garnonch	Rh	Dg	1
<i>Burseraceae</i>	<i>Boswellia carterii</i>	Elkander	Re	Dg,Der	1
	<i>Commiphora myrrha</i>	Sebr/elmor	Re	Der	1
<i>Cactaceae</i>	<i>Opuntia ficus-indica</i>	Dreg/lhandia	Fl,Le,Fr	GU	8
<i>Capparaceae</i>	<i>Capparis spinosa</i>	Elkabar/taylalut	WP	Tra,Res,Der,GU,Dg	5
<i>Caryophyllaceae</i>	<i>Arenaria rubra</i>	Bazett/bissat almuluk/rmam lmalik	Fr	ORL	1
	<i>Corrigiola telephiifolia</i>	Saghrina/tawserint	St,Rh	Der,Tra,Dg,Res,Neu	6
	<i>Herniaria hirsuta</i>	Herrast lahjer	WP,Re	GU,Dg,	11
	<i>Saponaria officinalis</i>	Tircht	Rh,Le	Dg,Neu,Der	3
<i>Colchicaceae</i>	<i>Androcymbium</i>	Temrat legrab/	Le	Res,GU	2

	<i>gramineum</i>	lessan jmel			
	<i>Cotyledon umbilicus</i>	Bakbouka	Rh	Dg	1
<i>Combretaceae</i>	<i>Terminalia chebula</i>	Hlij	WP,Se	Dg	2
<i>Crassulaceae</i>	<i>Cotyledon umbilicus veneris/ Ombilicus rupestris</i>	Sorrat el ard	Le	Dg	1
<i>Cucurbitaceae</i>	<i>Citrullus colocynthis</i>	Alhadja	Fr	Met,Der,Tra	8
	<i>Ecballium elaterium</i>	Fegouss lahmar	Fr	Der	1
	<i>Lagenaria longissima</i>	Garaa slawiya	WP,Fr	Neu	1
<i>Cupressaceae</i>	<i>Juniperus phoenicea</i>	Ara-aar	Le,Se	GU,CV,Dg,Der,Neu	8
	<i>Tetraclinis articulata</i>	Semmak	Rh	Dg	1
<i>Cyperaceae</i>	<i>Cyperus rotundus</i>	Tara	Rh,WP,H,	Der,Neu,Dg,CV,	6
<i>Euphorbiaceae</i>	<i>Euphorbia officinalis</i>	Zakoum	St,Latex,Le,WP	Der,Met	3
	<i>Euphorbia resinifera</i>	Takaout	Fr,Le,	Bu,Der,Res,	2
	<i>Mercurialis annua</i>	Herega el malssa	Le,WP	Der,Dg,He,CV,GU	11
	<i>Ricinus communis</i>	Kharouaa	Se,H	Der	4
<i>Fabaceae</i>	<i>Acacia arabica</i>	Lmür	WP,Re	Dg,Der,GU	2
	<i>Acacia gummifera</i>	Talh/tifizza/laalk	Re	Tra,Dg,GU	1
	<i>Anagyris foetida</i>	Fol jrarhiya	Se	Tra	1
	<i>Astragalus caprinus</i>	Samgh elâanzarout	Se	Dg,Res	1
	<i>Astragalus mareoticus</i>	Tamrat alakrab/ hchechat laakreb	WP	Res,Oph,GU	1
	<i>Astragalus sesameus</i>	Gren larzal	Fl	Neu	1
	<i>Cassia fistula</i>	Kharoub hindi	Fr	Res,Tra,He,Neu	2
	<i>Cassia senna</i>	Senna mekki	Le	Dg,Neu,	3
	<i>Ceratonia siliqua</i>	Kharoub/ timarin	Fr,Se	Dg,Tra,Met,Res,He,	13
	<i>Cicer arietinum</i>	Homes	Se	Der	3
	<i>Crotalaria saharae</i>	Elfilya/ fula	PE	Tra	1
	<i>Glycine max</i>	Fol gnawa/Soja	Se	GU,Neu	1
	<i>Glycyrrhiza glabra</i>	Arkssouss	Rh,St	Dg,Res,Neu,GU,BD	8
	<i>Lathyrus sp</i>	Buqrun	Rh	Dg	1
	<i>Lupinus albus</i>	Termess	Se	Neu	1
	<i>Medicago sativa</i>	Fassa	WP	GU,Tra,Dg,Met	2
	<i>Melilotus indica</i>	Tazmort/tazumart	WP	Der	1
	<i>Trifolium alexandrinum</i>	Berssim	WP,Se	CV	1
	<i>Trifolium arvense</i>	Nefla	Le,Se	Der,CV,Dg	2
	<i>Trigonella foenum graecum</i>	Lhalba	Se,H	Dg,CV,Der,Met,	39
<i>Fagaceae</i>	<i>Castanea sativa</i>	El qesttan	H	Dg,Der,Tra	1
	<i>Quercus rotundifolia</i>	Baloutt	Fr	Neu,GU	2
<i>Geraniaceae</i>	<i>Pelargonium graveolens</i>	Maatercha	Le,WP	Neu,Dg	3
<i>Illiciaceae/ Schisand raceae</i>	<i>Illicium verum</i>	Badyana	Fr,Fl,Se	Dg,Res,	3
<i>Iridaceae</i>	<i>Corcus sativus</i>	Zaafran	Fl	Dg,Res,Der,Oph, Tra,GU,He,	11
	<i>Iris florentina</i>	Elanbar/anbar/ aternichah	Fl,St	Oph,Dg,Met	2
	<i>Iris germanica</i>	Achochen/sawssan	Le	Neu	1
<i>Juglandaceae</i>	<i>Juglan regia</i>	Swak	Ec	BD,	1
<i>Juncaceae</i>	<i>Juncus maritimus</i>	Smar	Se,PE	Der,Res	2
	<i>Ajuga iva</i>	Chendkoura	Le,WP,St,	Dg,Der,Met,	9
	<i>Calamintha officinalis</i>	Manta	WP	GU	1
	<i>Lavandula dentata</i>	El khouzama zerka	WP,Fl	Der,GU,Res	4
	<i>Lavandula multifida</i>	Elkehela	WP,	Res,GU	2

<i>Lamiaceae</i>	<i>Lavandula stoechas</i>	El khouzama/halhal	Le,WP,Fl	Res,Dg,GU,Neu,Met	19
	<i>Marrubium multibracteatum</i>	Merro	WP	ORL	1
	<i>Marrubium vulgare</i>	Miriwt	WP,Le	Dg,Neu,Met,GU, Tra,Der,	9
	<i>Mentha aquatica</i>	Naânâ dyal lma	Le,WP	Dg,Neu,Der,Res	2
	<i>Mentha piperita</i>	Naânâ elabdi	Le,WP	Dg,Neu,Der,Res	2
	<i>Mentha pulegium</i>	Flio	Le,WP	Met,Res,Neu	11
	<i>Mentha rotundifolia</i>	Timija/marssita	WP,Le	Met,Neu,Der,GU	12
	<i>Mentha viridis</i>	Naânâ	WP,Le	Dg,Der	1
	<i>Ocimum basilicum</i>	Lahbek	Le	Neu,Tra,CV	1
	<i>Origanum compactum</i>	Zaatar	Le,PE,H	Dg,GU,Res,Neu, BD,Der,CV	100
	<i>Origanum majorana</i>	Merdedouch	Le,WP	GU,CV,Dg,Neu, Tra,Res,Met	7
	<i>Origanum vulgare</i>	Zaatar barri	Le,PE,H	Dg,Met,CV,Der	7
	<i>Rosmarinus officinalis</i>	Azir/azazr	Le,WP,H	Dg,Der,Res,CV, Tra,He,GU	19
	<i>Salvia officinalis</i>	Salmia	Le,WP,H	Met,He,GU,Neu, CV,BD,Der	19
	<i>Satureja graeca</i>	Achnan dawd	Le,WP	Der,Dg	3
	<i>Teucrium polium</i>	Jaâidiya	Le	Neu,Der,Dg,Tra, Res, GU	5
	<i>Thymus satureioides</i>	Zaitra	WP,Le	Tra,IMM,Dg,Res	5
<i>Lauraceae</i>	<i>Cinnamomum zeylanicum</i>	Karfa	Ec,St	CV,Met,GU	5
	<i>Laurus nobilis</i>	Wrak moussa	Le	Tra,Dg,GU	4
<i>Linaceae</i>	<i>Linum usitatissimum</i>	Zareat lkatane	Se	Res,GU,Neu,Der, Tra,Oph,Dg	10
<i>Lythraceae</i>	<i>Lawsonia inermis</i>	Henna	Le	Der,Dg,Neu	9
	<i>Punica granatum</i>	Kchour roman	Fr,Ec,	Dg,Neu,Der	13
<i>Malvaceae</i>	<i>Althaea longiflora</i>	Ward zwan	Le	Dg	1
	<i>Hibiscus abelmoschus</i>	Meskka hourra	Re	Dg,BD,Neu	5
	<i>Hibiscus sabdariffa</i>	Karkadi	Fl	He	1
	<i>Malva sylvestris</i>	Khebiza	Le,WP	Dg,Res,GU,	4
<i>Moraceae</i>	<i>Ficus carica</i>	Karmouss	Fr,Latex	Dg,GU,Res,Der	10
<i>Myristicaceae</i>	<i>Myristica fragrans</i>	Elgouza	Se	Neu	1
<i>Myrtaceae</i>	<i>Eucalyptus globulus</i>	Kaliptus	Le	Neu,Res,Dg,Tra,GU	19
	<i>Eugenia caryophyllata</i>	Krenfel	clou,	Dg,Bu,Res,Der,BD, Neu,Tra	8
	<i>Myrtus communis</i>	Rayhan	Le	Der,Dg,BD,Neu, Res	11
<i>Nitrariaceae</i>	<i>Peganum harmala</i>	Harmel	Se	Der,Neu	2
<i>Oleaceae</i>	<i>Fraxinus angustifolia</i>	Dardar/lessan tyr	Se,Le	Dg,Neu,	5
	<i>Olea europaea</i>	Zaytoun	H,Le,Fr	Dg,Res,BD,CV, Met,Der,Tra,GU	17
<i>Orchidaceae</i>	<i>Orchis morio</i>	Elhaya et mayta	WP	Dg	1
<i>Paeoniaceae</i>	<i>Paeonia coriacea</i>	Filiya	WP	Tra	2
<i>Papaveraceae</i>	<i>Papaver rhoeas</i>	Balaamane	Fr,Fl	Neu,Der,Dg	2
<i>Pedaliaceae</i>	<i>Sesamum indicum</i>	Janjlan	Se	Dg,Neu,CV,Met, GU	2
<i>Pinaceae</i>	<i>Cedrus atlantica</i>	Al arz	H,	Met	1
	<i>Pinus halepensis</i>	Tayda	Le	Dg,GU,Neu,Res, Tra	3
<i>Piperaceae</i>	<i>Piper longum</i>	Dhar lfelfel	Le	Dg,TraL	1
	<i>Piper nigrum</i>	Labzar	Se	Tra,Der	2
<i>Plantaginaceae</i>	<i>Globularia alypum</i>	Tasalra	WP	Dg	1
	<i>Plantago major</i>	El Massassa	Le	Der,Res,GU	3
	<i>Plantago ovata</i>	Zerkouna	Le,WP,Se	CV,Res,Dg	2

	<i>Plantago psyllium</i>	Zerkouna	Se,WP,	Der,Dg,Tra,Oph	3
<i>Poaceae</i>	<i>Agropyron repens</i>	Enjem/silbo	Rh	Der	2
	<i>Avena sativa</i>	Khartal/chofan	Se	Dg,Tra,BD,Neu,	4
	<i>Cynodon dactylon</i>	Njem	Rh,PE,	GU,He,CV,Der,	7
	<i>Hordeum vulgare</i>	Chaaïr	Se	Tra,Der,Dg,	4
	<i>Oryza Sativa</i>	Roz	Se	Der	2
	<i>Pennisetum typhoides</i>	Illan	Se	Tra	3
	<i>Saccharum officinarum</i>	Kassab sokar	St	Dg,Neu,	1
	<i>Triticum durum</i>	El hobob/Lagamh	H	Tra,Der	1
	<i>Zea mays</i>	Lakbal/draa	Se,H,Poil	GU,Neu	4
<i>Polygonaceae</i>	<i>Calligonum comosum</i>	Dbagh	Ec,St	Dg,Der	4
	<i>Emex spinosa</i>	Hemeda lafrakh	Le,WP	He,	3
	<i>Fallopia multiflora</i>	Assa raâi	WP	Met	1
	<i>Polygonum aviculare</i>	Wadmu	Le	Tra,Der,Neu	3
	<i>Rumex acetosa</i>	Selk lbarri	Rh,Fr,PE,	GU,Dg	6
<i>Portulacaceae</i>	<i>Portulaca oleracea</i>	Trejla/rejla	WP	Neu,Dg,Res,Tra, Der	3
<i>Ranunculaceae</i>	<i>Clematis flammula</i>	Yasamin bari	WP	Neu	1
	<i>Delphinium</i>	Habat rass	Se	Der	2
	<i>staphisagria</i>				
	<i>Nigella sativa</i>	Saneuj/haba sawda	Se	Dg,CV,Res,BD,	23
				Met,GU,Neu,Tra	
<i>Rhamnaceae</i>	<i>Ranunculus bullatus</i>	Oudn lhalouf	St,Rh,PE	Neu,Dg,Der,GU, Met	4
	<i>Zizyphus lotus</i>	Sdar/nbeg	Le,Se,Fr	Dg,Der,GU,CV, Met	17
<i>Rosaceae</i>	<i>Crataegus monogyna</i>	Zaâror/admam	WP	CV,Neu,Dg,Der	3
	<i>Cydonia oblonga</i>	Sfarjel	Se	Der	1
	<i>Eriobotrya japonica</i>	Mzah	Le	Dg	1
	<i>Prunus amygdalus</i>	Louza	Se,H	Der	2
	<i>Prunus domestica</i>	Barkouk	Fr	Dg	1
	<i>Pyrus communis</i>	Ejjass	Fr	Neu,CV,Dg	1
	<i>Rosa damascena</i>	Lward lbaldi	Fl,H	Der,Neu,Dg,Der	5
	<i>Rubus ulmifolius</i>	Achdir/aâlig	WP	Dg	1
<i>Rubiaceae</i>	<i>Rubia peregrina</i>	Layron/uruk	Le	Der, CV	1
		sabaghine			
	<i>Rubia tinctorum</i>	Elfowa	Rh	Dg,GU,He,Tra,	9
<i>Rutaceae</i>	<i>Citrus aurantium</i>	Zanboua	Fr,Fl	Dg,Neu,CV,Tra,	4
				Res, Met	
	<i>Citrus limon</i>	Hamed	Fr,Fl	Res,Der,	4
	<i>Citrus sinensis</i>	Lemon	Fr,	Res,ORL	1
	<i>Ruta chalepensis</i>	Fijl ejmel	WP,Se,	Res,Dg	2
	<i>Ruta graveolens</i>	lafel	Rh,Se	GU,Res	2
	<i>Ruta montana</i>	Fijl	WP,Se	Dg,Neu,Der	4
<i>Salicaceae</i>	<i>Populus alba</i>	Sefssaf	Le	GU	1
	<i>Salix babylonica</i>	Salf adra	Le	Der	1
<i>Salvadoraceae</i>	<i>Salvadora persica</i>	Oud alarak	St	BD,	2
<i>Sapotaceae</i>	<i>Argania spinosa</i>	Argan	Se,H	Dg, CV, Der, Met	3
<i>Scrophulariaceae</i>	<i>Verbascum sinuatum</i>	Bahijat laayoun/ moslih andar	WP	Oph,	1
<i>Solanaceae</i>	<i>Capsicum frutescens</i>	Falfla lharra	Fr	Der	1
	<i>Lycium intricatum</i>	Murza/lrerdeg	Le	GU	1
	<i>Solanum nigrum</i>	Aaneb dib	Fr	He,Dg	2
	<i>Solanum sodomaeum</i>	Meticha lehmîr	Fr	Der	1
<i>Thymelaeaceae</i>	<i>Daphne gnidium</i>	Alzaz	Le	Der	4
	<i>Thymelaea hirsuta</i>	Matnan	Le	GU	1
<i>Typhaceae</i>	<i>Typha angustifolia</i>	Etefta/tifa	WP	Met	1
<i>Urticaceae</i>	<i>Urtica dioica</i>	Herega lharcha	WP,Le	GU,Neu,Dg, Met	6
<i>Valerianaceae/</i>	<i>Valeriana jatamansi</i>	Sanbel	Le	Res,Der,Dg	3

<i>Caprifoliaceae</i>					
<i>Verbinaceae</i>	<i>Lippia citriodora</i>	Lwiiza	Le	Neu	1
	<i>Verbena officinalis</i>	Louiza/baymoute	Le	Neu,Dg,Tra,Res,Met	25
<i>Violaceae</i>	<i>Viola odorata</i>	Banafsaj	WP,Fl	Dg,Res,Oph	5
<i>Xanthorrhoeaceae</i>	<i>Aloe socotrina</i>	Ssabra	Le	Tra, Der,Dg,Res,	9
	<i>Aloe vera</i>	Sebr/Aloe vera	Le	GU,Tra,	1
	<i>Asphodelus</i>	Blalouz/	St,Rh	Der,ORL,Dg,Res	4
	<i>microcarpus</i>	joudour barwk			
<i>Zingiberaceae</i>	<i>Aframomum melegueta</i>	Elgouza sahrawiya	Se,Fr	Res,Neu,Tra,GU,Dg	7
	<i>Alpinia officinarum</i>	Khedenjal	St,Rh	Dg,Res,Neu,GU,Tra	9
	<i>Curcuma longa</i>	Kharkoum	Rh	He,IMM,GU,Der,	12
				Dg,CV,Met	
	<i>Elettaria</i>	Kaākola/hab	Se	Dg	1
	<i>cardamomum</i>	hal/jabhan			
	<i>Zingiber officinale</i>	Skenjbir	Rh	GU, Dg, Res, Met,	12
				IMM, Tra	
	<i>Zygophyllum</i>	Laagaya	Le	Dg, Met	3
	<i>gaetulum</i>				

The floristic families richest in species used as medicinal plants in the studied region

Fig. 7 shows that the family of Asteraceae is the most used with 24 species, followed by Lamiaceae with 21 species, Fabaceae with 20 species, Apiaceae with 17 species, Poaceae with 9 species and Rosaceae with 8 species and Brassicaceae with 7 species. These results show the dominance of the families which occupy the first ranks in the flora of Morocco. This finding is approved by the study of El Hafian (2014) at the prefecture of Agadir-Ida-Outanane.

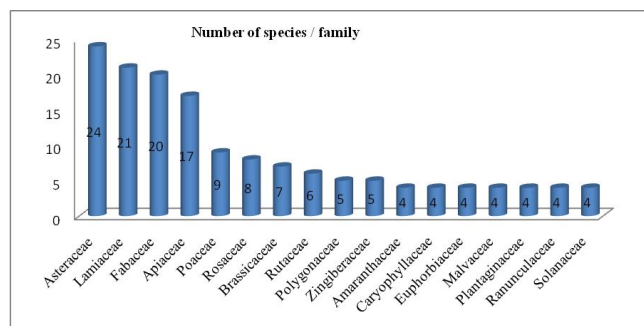


Fig. 7: Family-specific wealth of the most used medicinal plants in the Middle Oum Rbai.

Diseases treated with medicinal plants in the study area

The analysis of the results obtained made it possible to identify the different types of pathologies treated by medicinal plants in the region studied. The majority of respondents use plants to treat disorders of the digestive system (535 citations), Respiratory system affections occupy the second position (170 citations), second dermatological conditions (167), neurological conditions (150 citations) and metabolic disorders (78 citations) (Fig. 8). Previous studies, carried out at the national level, such

as those of Lahsissène *et al.*, (2009); Salhi *et al.*, (2010), El Hilah *et al.*, (2015) and Rhattas *et al.*, (2016) have reached the same conclusions and have pointed out that disorders of the digestive, respiratory and dermatological systems are the most treated by medicinal plants.

Dose used

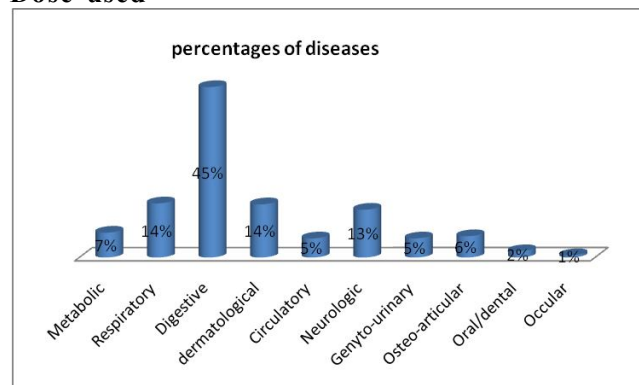


Fig. 8: Frequency of diseases treated by medicinal plants in the Middle Oum Rbai.

According to the results obtained, 43% of informants report using a specific dose in the treatment of diseases by medicinal plants and 57% use traditional medicine without respecting the dose. Most users of medicinal plants do not consider the dose for treatment with plants, which is a health hazard and can produce poisoning in case of high dose or prolonged use.

Toxicity of medicinal plants

Most medicinal plants contain naturally toxic substances or active ingredients and they can accumulate chemicals as a result of their exposure to pollutants such as pesticides. These plants can become toxic, starting from a certain dose; toxicity that occurs following administration of part of the plant or through skin contact. During the year 2015, the Moroccan Poison Control

Center (CAPM) recorded 226 cases of plant poisoning and traditional pharmacopoeia products (PPPT), which represents 1.6% of all poisonings reported to CAPM outside the bites and scorpion envenomation (PES) (Toxicology Morocco Review, 2015). In our region, some respondents declared the toxicity of certain plants either in high doses or according to the person (pregnant woman, child) namely: *Chenopodium ambrosioides*, *Catharanthus roseus*, *Nerium oleander*, *Atractylis gummifera*, *Berberis vulgaris*, *Brassica nigra*, *Citrullus colocynthis*, *Urginea maritima*, *Ruta montana*, *Myristica fragrans*.

Conclusion

The ethnobotanical survey conducted in the Middle Oum Rbia region between 2010 and 2015 involved 1360 randomly selected people in 34 strata at a rate of 40 people per stratum. Analysis of the data collected from the questionnaires on the informant profile and the use of medicinal plants has yielded important results. Thus, 69% of respondents combination between modern and traditional medicine for healing, 19% practice traditional medicine and only 12% use modern medicine. 58% of people in the study area who use medicinal plants for treatment are women. People aged between 30 and 50 years use the most medicinal plants (58%), people over the age of 50 represent 23% of the total workforce. Regarding the level of schooling, 36% of people who practice traditional medicine are illiterate. Married people use traditional medicine much more frequently than single men (69%). The source of information concerning the use of this or that medicinal plant is for 84% of the surveyed population, the experience of others. Improving health status after use of medicinal plants was reported by 66% of respondents, while 33.6% report that herbal recipes are effective. The results obtained also show that the leaf and the seed are the most used parts of the plant. Infusion and decoction are the most common methods of preparation. On the other hand, the floristic analysis of inventoried medicinal plants made it possible to identify 74 families and 238 species. *Origanum compactum* is the species most commonly used by the local population, followed by *Trigonella foenum graecum* and *Chenopodium ambrosioides*. Asteraceae, Lamiaceae, Fabaceae, Apiaceae, Poaceae, Rosaceae and Brassicaceae, are the richest families of species with medicinal value in the study area.

The results obtained also show that the most treated pathologies by the population interviewed are disorders of the digestive system, diseases of the respiratory system and dermatological conditions.

The study of medicinal plants in the region of Oum Rbia allowed the identification of 238 species with therapeutic potentialities. An inestimable heritage that needs to be valued for the benefit of the local population and respect of the environment.

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