



## Ethnobotanical study of medicinal plants from Er-Rich region (Moroccan High Atlas)

<sup>1,2</sup>Kamal Fadili, <sup>1,2</sup>Chakib Sekkate, <sup>1,2</sup>Fathia Alistiqsa, <sup>1,2</sup>Zoubida Haloui, <sup>1,2</sup>Said Chakir, <sup>1,2</sup>Touriya Zair

<sup>1</sup>Research team of Bioactive Molecules Chemistry and Environment, Faculty of Sciences, B.P 11201 Zitoune, Moulay Ismail University, Meknes, Morocco.

<sup>2</sup>Laboratory of Materials Chemistry and Biotechnology of Natural Products, Faculty of Sciences, B.P 11201 Zitoune, Moulay Ismail University, Meknes, Morocco.

### Address For Correspondence:

kamal Fadili. Research team of Bioactive Molecules Chemistry and Environment, Faculty of Sciences, B.P 11201 Zitoune, Moulay Ismail University, Meknes, Morocco.

Tel : +212646102475; E-mail: [kamal.fadili@hotmail.fr](mailto:kamal.fadili@hotmail.fr)

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### ABSTRACT

This study is part of the development of Moroccan High Atlas resources with a focus on medicinal plants and traditional knowledge. An ethnobotanical survey was conducted in February, March, April and May 2014 with the population of Er-Rich circle using 150 questionnaires. Analysis of the results allowed us to establish a list of 67 plants, divided into 29 families with a dominance of *Asteraceae* and *Lamiaceae* families. Analysis of the results of this ethnobotanical survey also shows that in traditional medicine, the most frequently cited and used species by the local population are : *Rosmarinus officinalis*, *Thymus satureioides*, *Mentha suaveolens*, *Artemisia herba-alba*, *Foeniculum vulgare* and *Mentha pulegium* . Moreover, leaves are the most used parts of the plants, the majority of the remedies are prepared as a decoction. Most recipes are orally administered and digestive disorders are among the most frequently treated. These results can be considered as a source of information for scientific research in the field of plant chemistry in order to identify new natural active principles that can be used in pharmacology.

**KEYWORDS:** Medicinal plants, Ethnobotanical study, Er-Rich, Moroccan Eastern High Atlas.

### INTRODUCTION

Ethnobotany has become a primordial discipline which proposes to analyze reciprocal relations that unite human being to plants. Through this purpose it represents a key for the development of the societies.

Research in ethnobotany is mainly based on results of field surveys and bibliographic data gathering. These surveys are generally carried out as interviews and observation of practices with resource persons identified as having knowledge and / or know-how related to the plant materials. There is no ideal recipe for a good investigation, but there are rules to be followed at each step of the investigation.

In addition, the ethnobotanical study allowed discovery of several active substances for pharmaceutical firms. Active ingredients currently used in modern medicine are derived from popular and traditional medicinal knowledge. Moreover, the discovery of these substances is based on the observation of the efficacy of certain plants from various pharmacopoeias (Arab-Muslim, European, Indian or Chinese pharmacopoeias), but also mainly from the observations of plants uses in traditional medicine.

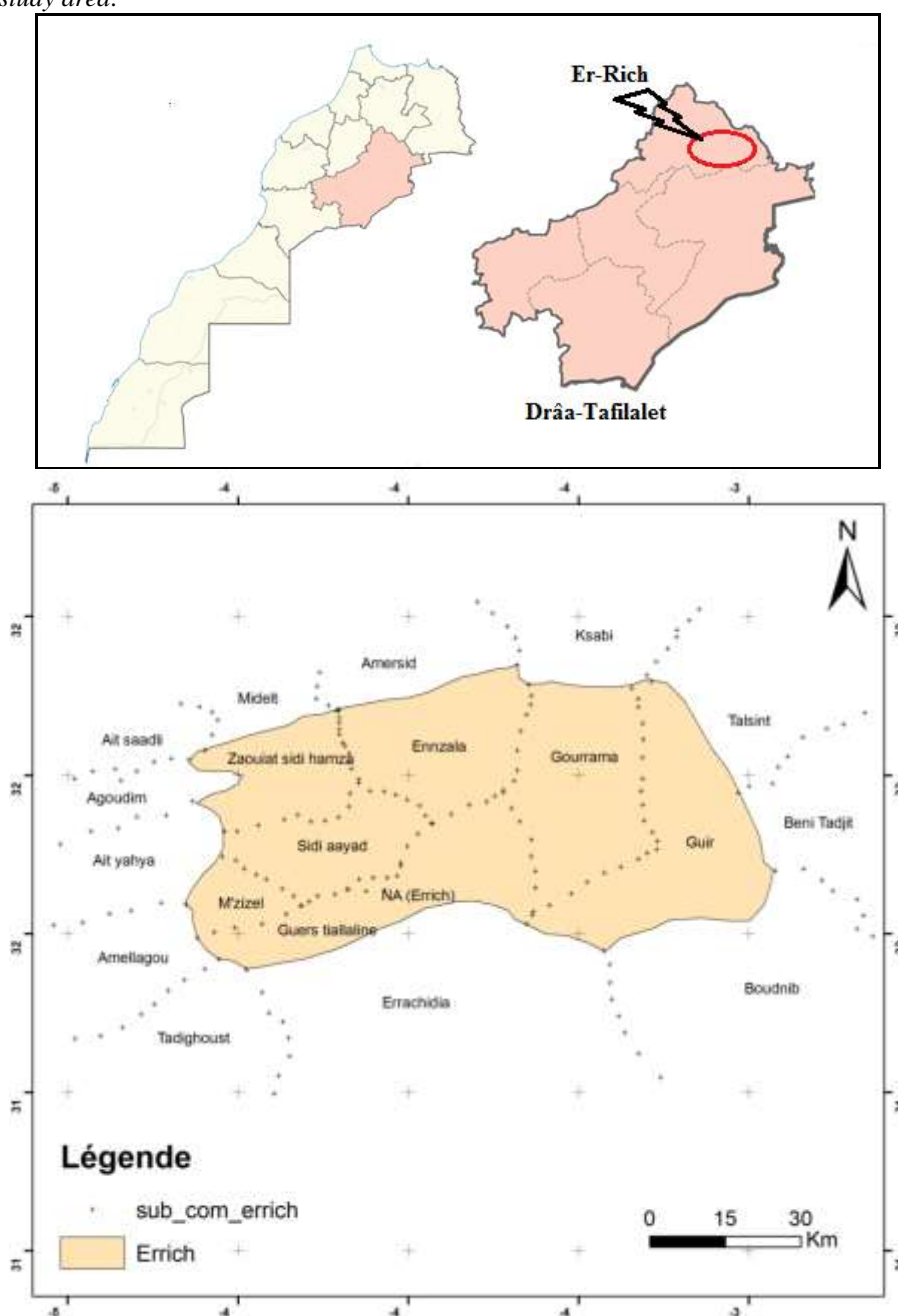
The sector of aromatic and medicinal plants (AMP) remains highly promising since it promotes the creation of income-generating activities. This sector offers the possibility to create small and medium-sized enterprises

that promote plant biodiversity in respect with development and the protection of natural and cultural heritage. Traditional medicine continues to be the main use of a large majority of populations to solve their health problems, not only because it constitutes an important element of cultural heritage, but also because of limited financial resources of populations towards conventional products. It was orally transmitted from a generation to the next one, exposing it to the danger of loss. The ethnobotanical survey is essential to acquire knowledge about medicinal plants and their uses.

Morocco is a mediterranean country with a long medicinal tradition and a traditional know-how based on medicinal plants [1]. Indeed, traditional medicine has always played an important role in medication habits in Morocco. Er-Rich region (Eastern High Atlas of Morocco) is very rich in aromatic and medicinal plants but this wealth is not properly exploited by the population. The aim of this study is to give value to the plant traditional heritage in the region (Er-Rich) by listing aromatic and medicinal plants of the region and discovering traditional uses. The study is also extended to traditional exploitation of the plant species in the region.

## MATERIAL AND METHOD

*Description of study area:*



**Fig. 1:** Geographic location of the study area (Er-Rich circle)

Created in 2009, the Province of Midelt is subdivided in to two circles: Midelt and Er'rich. This landlocked province shares borders with several other provinces: at the north, the province of Ifrane, at the south is found the province of Er-Rachidia, the province of Khenifra is at the west and the eastern border lead to the province of Boulmane. Er-Rich is a town located at the foot of Atlas Mountains, at the confluence of Ziz river and Sidi Hamza river. The town is located 75 km of Midelt and 66 km of Er-Rachidia.

Er-Rich circle comprises seven townships: Guers Tiaallaline, En-Nzala, M'Zizel, Sidi Aayad, Zaouiat Sidi Hamza, Guir and Gourrama (Figure 1) and is part of Midelt province which is now part of Drâa-Tafilalet region. This circle covers about 5969 Km<sup>2</sup> [2]. According to 2014's national census, its population is estimated at 83707 inhabitants (Table 1). The arid climate of this presaharian region is characterized by a dry and cold winter and a hot summer. Precipitation fluctuates from a year to the next one with an annual average between 120 and 276 mm. In winter, snowfall can begin from mid-November at altitudes above 1 800 m. Temperatures range from -2 in winter to 35 °C in summer.

**Table 1:** Townships of Er-Rich circle

Townships	Population
Er-Rich (Municipality)	25985
Guers Tiaallaline	12924
En-nzala	4390
M'Zizel	7380
Sidi Aayad	8629
Zaouiat sidi Hamza	5454
Gourrama	14923
Guir	4022
Total	83707

#### Methodology:

With a pre-established questionnaire (appendix 1), we have conducted an ethnobotanical survey in February, March, April and May 2014 in Er-Rich circle. Random and stratified sampling technique [3] was used in order to have the most complete floristic inventory as possible and to easily carry out various ethnobotanical surveys from one area to another in Er-Rich region.

To bring out a representative study of the area, we have selected ten strata (ten Douar): Er-Rich, Tabia, Zawiat sidi boukil, Oulal, Tamagourt, Aitkhoujmane, Aitaatou, Zaouiat sidi Hamza, Nezala and Gourama. In each stratum, a sample of 15 individuals was selected for the survey (Table 2). Thus, one hundred and fifty (150) persons were spontaneously and directly interviewed.

People favorably responded during this preliminary study that encompasses specific questions such as informants profile (ie age, education level, gender,...), the most abundant plants, the most used plants with their vernacular identity, part of the plant used, the methods for remedies preparation, the routes of administration and the treated pathologies. Then, taxonomic identification of the samples collected in each stratum was performed in the laboratory and was confirmed at the Scientific Institute of Rabat in the Laboratory of Botany and Plant Ecology. Most species' names are only known in Tamazight language.

**Table 2:** Geographic strata covered by the survey

Stratum associated number	Stratum's name (Douar)	Number of interviewees
1	Er-Rich	15
2	Tabia	15
3	Zawiat sidi boukil	15
4	Oulal	15
5	Tamagourt	15
6	Aitkhoujmane	15
7	Aitaatou	15
8	Zawiat sidi hamza	15
9	Nezala	15
10	Gourama	15
Total : 150		

#### Data processing:

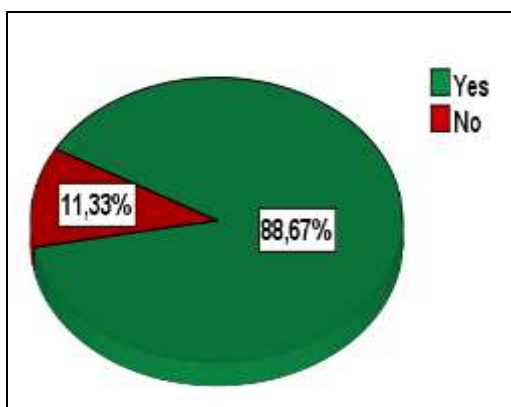
Raw data were transferred in to a database and processed by SPSS statistical analysis software.

## RESULTS AND DISCUSSION

#### Interviewees' profile :

##### 1) Choice between traditional plant therapy and modern medicine :

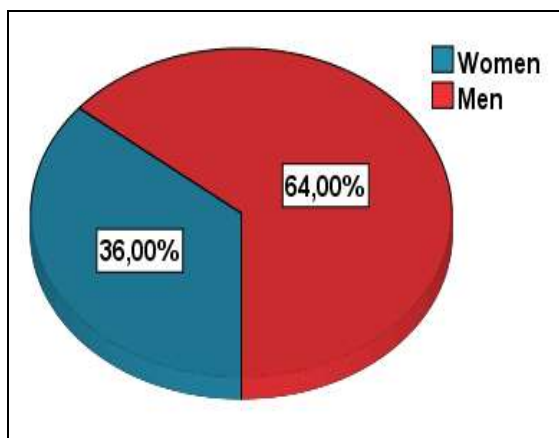
The survey revealed that 88.67% of this population prefer medicinal plants (Figure 2) rather than modern medicines.



**Fig. 2 :** Percentage of people using traditional medicine

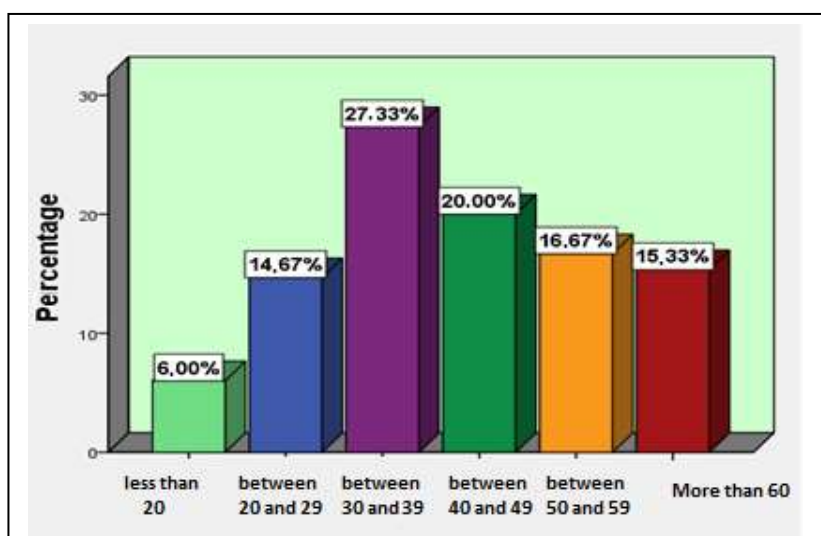
2) *Distribution by gender:*

In our study area women and men have shown their interest in traditional medicine with plants: 64% of respondents were men and 36% were women (Figure 3).



**Fig. 3:** Frequency of Aromatic and Medicinal Plants (AMP) usage by gender

3) *Distribution by Age :*



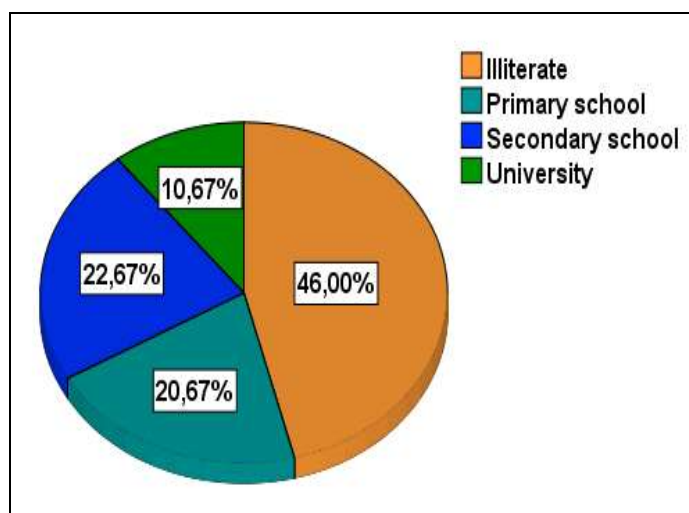
**Fig. 4:** Frequency of AMP usage by age group

Analysis of questionnaires reveals that although the usage of MAP is widespread in all age groups, it is predominant within the age group of 30-40 years old (27.33%), then comes the group of 40-50 years old (20%).

The following age groups: 50- 60 years, above 60 years and 20-30 years, come after with respectively 16.67%, 15.33% and 14.67% (Figure 4). However, use of traditional medicine is not very common among people younger than 20. Knowledge about the uses and properties of medicinal plants is usually accumulated through long-time experience and it is then transmitted from one generation to the next. Therefore, older people are more familiar to traditional herbal medicine compared to the other age groups. This difference in use, depending on the age group could be explained by the fact that older people are more knowledgeable about tradition, including traditional herbal medicines. The difference could be also explained by new behavior adopted by the youth who trust science and modernity rather than tradition.

#### 4) Distribution by education level :

From the survey, we find in the ten strata that 46% of plants users are illiterate people. 20.76% had primary school level of education while 22.67% had secondary school level and 10.67% reached the university (Figure 5). These results show that 19.75% of school-going users have a university-level education. Indeed, since recent times, the use of herbal medicine and the return back to natural substances are being rediscovered thanks to scientific research in ethnopharmacology. This confirmed the therapeutic efficacy of traditional remedies that astonished scientists, doctors and pharmacologists. Moreover, considering the emergence of drug resistance, the need for therapeutic alternatives against resistant pathogens, the limits of modern medicines and the existence of diseases without effective treatment, traditional medicine could be a great advantage.



**Fig. 5:** Frequency of AMP usage by education level

#### Social pharmacological aspects:

##### 5) Families of the inventoried plants:

The use of plants for medicinal purposes is not a recent phenomenon. Despite the importance of the medicinal plants reported, much of this potential remains undervalued for multiple reasons starting from the lack of knowledge to the lack of effort to preserve this heritage. The combination of environmental conditions and the availability of resources are key conditions for determining distribution, distinctiveness and functionality of species in a particular region [4]. Ethnobotanical surveys in the Er-Rich region enabled us to develop a list of 67 medicinal species belonging to 29 families. Among these families, the most frequent in this region are: *Asteraceae* (11 species), *Lamiaceae* (10 species), *Apiaceae* (5 species), *Fabaceae* (4 species) and *Poaceae* (4 species) (Figure 6 Slimani *et al.* (2016) found in a study carried out in the Zerhoun region of Morocco that of the 43 families encountered, three families accounted for 32.43% of the total population with *Lamiaceae* (13.51%), *Apiaceae* (9.91%) And *Asteraceae* (9%) [5].

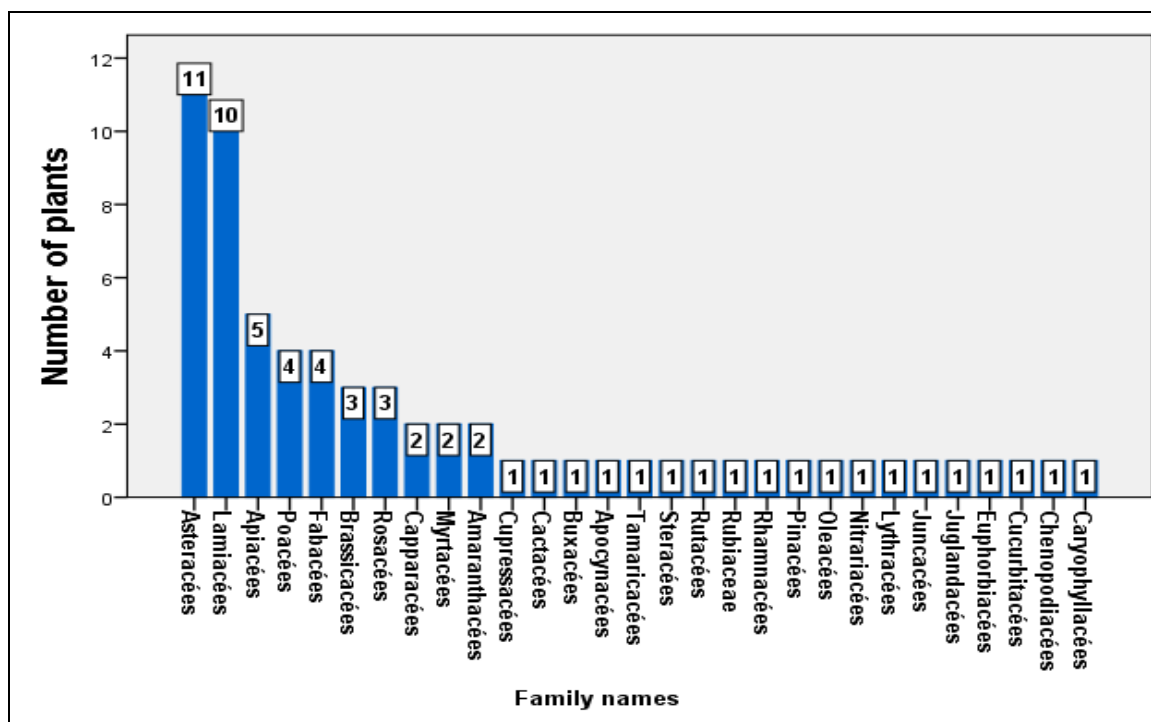


Fig. 1: Plant families in the study area

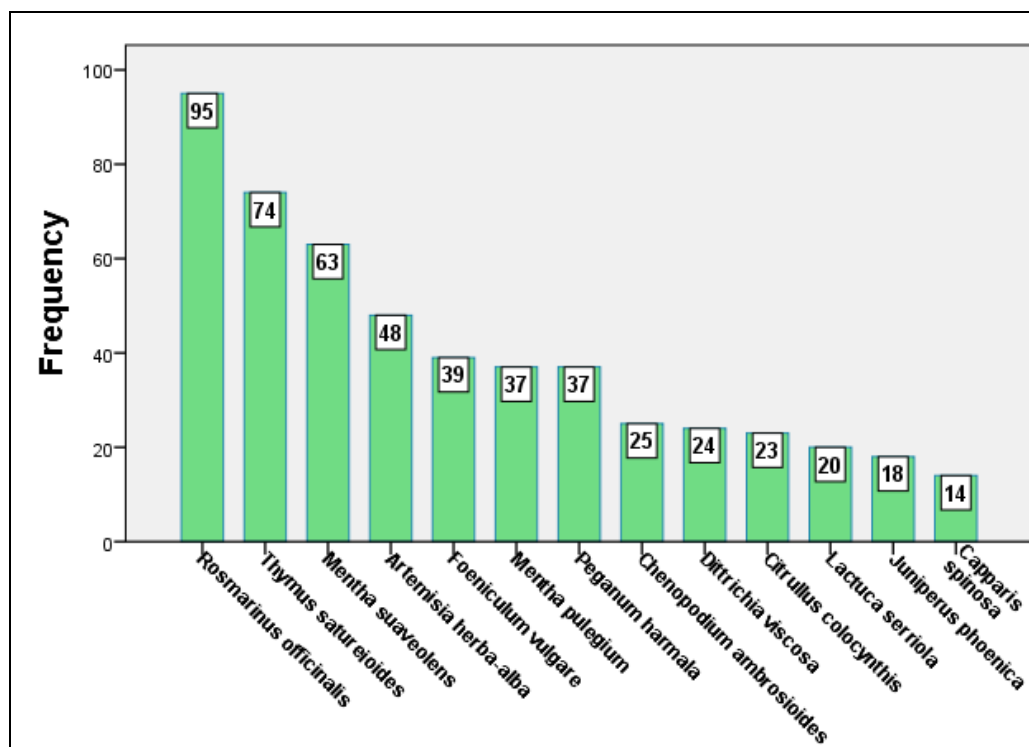
6) *The most popular plants:*

We found in the study that among the 67 inventoried species 13 were very much cited and very often used by people (Figure 7). These plants are ranked according to their importance (Table 3).

Table 3: The most used species in Er-Rich region

Rank	Species name	Rank	Species name	Rank	Species name
1	<i>Rosmarinus officinalis</i>	6	<i>Mentha pulegium</i>	11	<i>Lactuca serriola</i>
2	<i>Thymus satureioides</i>	7	<i>Peganum harmala,</i>		
3	<i>Mentha suaveolens</i>	8	<i>Chenopodium ambrosioides</i>	12	<i>Juniperus phoenica</i>
4	<i>Artemisia herba-alba</i>	9	<i>Ditrichia viscosa</i>	13	<i>Capparis spinosa</i>
5	<i>Foeniculum vulgare</i>	10	<i>Citrullus colocynthis</i>		

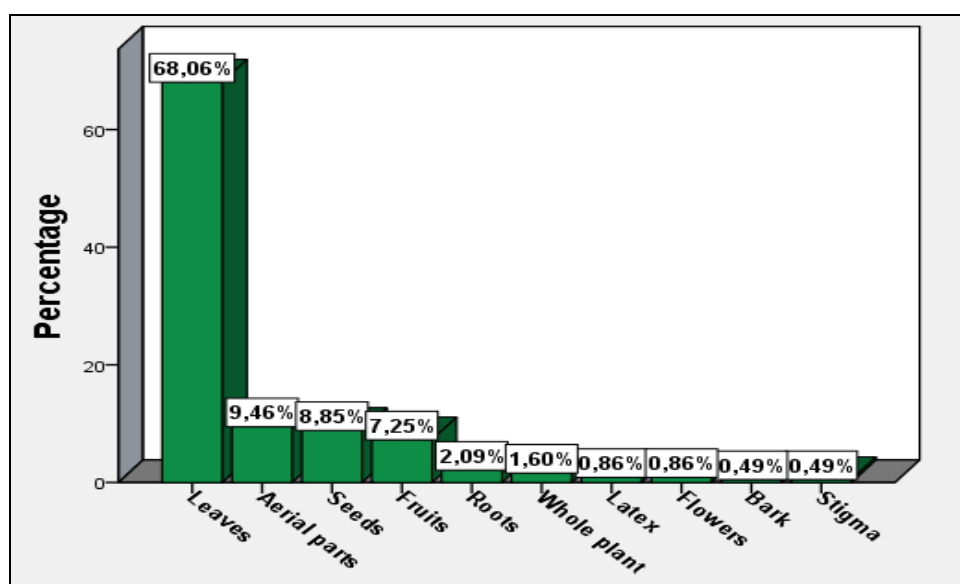
We also notice that some of these plants have never been studied: they have neither been mentioned in the literature nor reported in ethnobotanical studies in Morocco.



**Fig. 7:** Usage frequency of the most popular species in Er-Rich

7) *Plant parts used:*

The ethnobotanical survey revealed that leaves are the most commonly used part in this region with a percentage of 68.06% while aerial parts in general are used with a percentage of 9.46%. Then, come seeds (8.85%) and fruits (7.25%) (Figure 8). The other parts, namely stems, flowers, roots, bark, latex, stigma and whole plant are gathered with a cumulative percentage of 18.46%. Also, the predominance of use of a specific organ compared to another in the therapeutic domain is strongly linked to its concentration in active ingredients. Leaves are the most used because they are at the same time the site where photochemical reactions take place and a source of organic matters derived from these reactions. They provide the majority of alkaloids, heterosides and essential oils content. Fruits importance can be attributed to the concentrations of certain bitter compounds, carbohydrate or aromatic substances associated with some pigments which give them a specific coloring. Roots and seeds are rich in sugars and vitamins [6]. These results confirm those of other ethnobotanical studies [7-8].

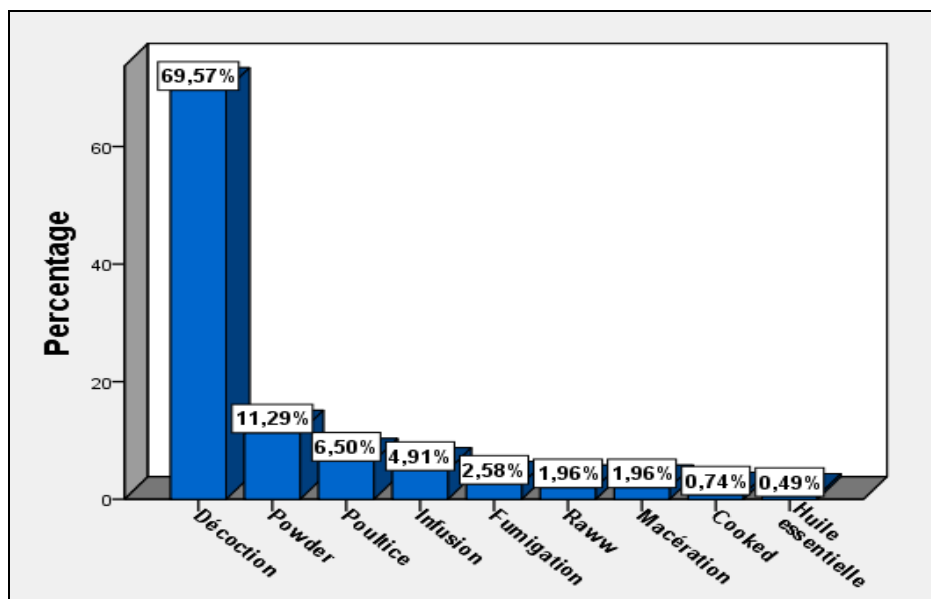


**Fig. 2:** Use frequency of plant parts

8) *Remedies preparation mode :*

Different therapeutic practices are used by the local population, namely decoction, infusion, powder preparation, fumigation, poultice, maceration and cooking. Decoction is the most frequent mode of preparation (69.57%) in the region (Figure 9). It is followed by powder (11.29%), and poultice (6.5%). The other modes (maceration, infusion, raw plant part, cooked part, fumigation and essential oil) represent 12.64%. These results confirm the data obtained in other national ethnobotanical studies [7,9].

The best preparation should be the one which preserves all plant properties during the process of extraction and the process of assimilation of the active ingredients [10]. Decoction is a good method to warm the body and disinfect the plant in order to suppress the toxic effect of some recipes, but it can also destroy certain active compounds of the species. Additionally, medicinal plants have adverse effects when they are not used in a proper way by patients. Therefore, medication by plants should be carefully practiced according to precise parameters and dosage.

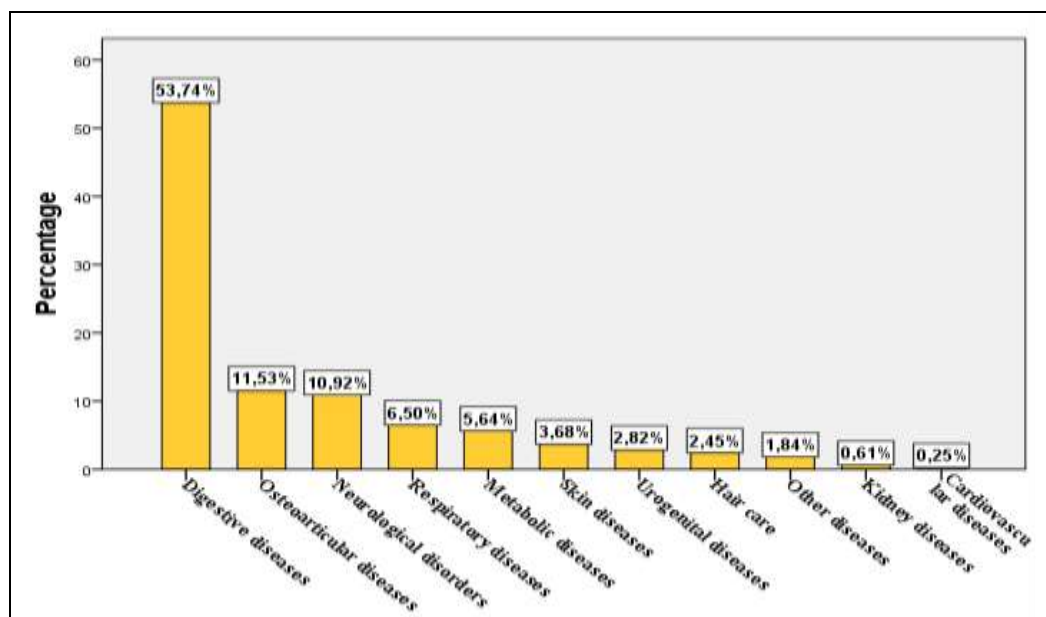


**Fig. 3:** Main preparation modes of remedies

9) *Medicinal use:*

Analysis of the collected information allowed us to list a number of diseases that are treated by medicinal plants in this region. The majority of medicinal plants are mainly used in the treatment of digestive diseases with a percentage of 53.74% followed by osteoarticular affections (11.53%), neurological disorders (10.92%) respiratory diseases (6.5%) and metabolic disorders (5.64%) (Fig.10). Urogenital diseases, skin diseases, cardiovascular diseases, kidney diseases, hair care, etc account for 11.65%. These results are similar to those of Maryama H. *et al.*, 2015[7] in the city of Khénifra, Zerkani H. *et al.* 2015[11] in the province of Khénifra, Rhattas M. *et al.*, 2016 [12] in the Western Rif region, Lahsissène *et al.* 2009 [13] in the region of Zaër, Mehdioui and Kahouadji, 2007 [1] in the province of Essaouira and Hseini *et al.* 2011 [14] in the region of Rabat. These authors reported that digestive diseases are the first cause of medicinal plants use.

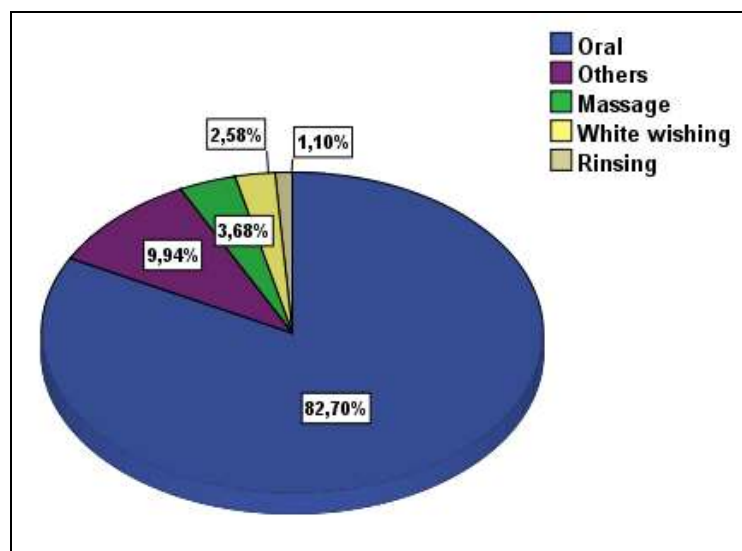




**Fig. 10:** Frequency of plant use according to the disease

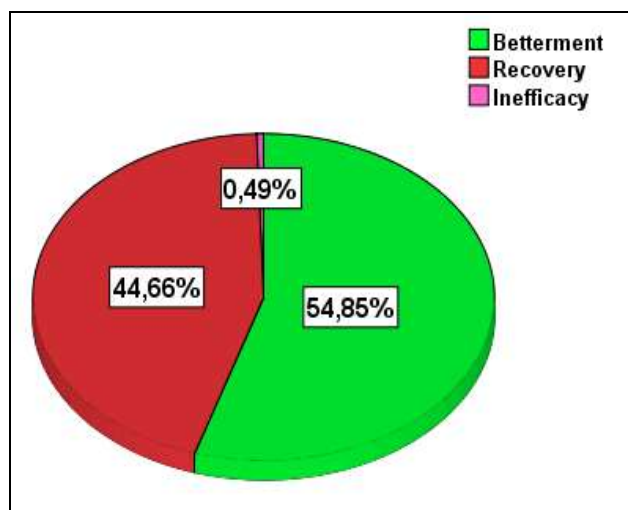
10) *Routes of administration:*

Figure 11 shows that most of the remedies are orally administered with a very high percentage (82.70%). The other routes of administration: whitewashing (2.58%), massage (3.68%), rinsing (1.1%) and other ways (9.4%) are less common.



**Fig. 4:** Main administration routes of remedies

11) *Health outcomes:*

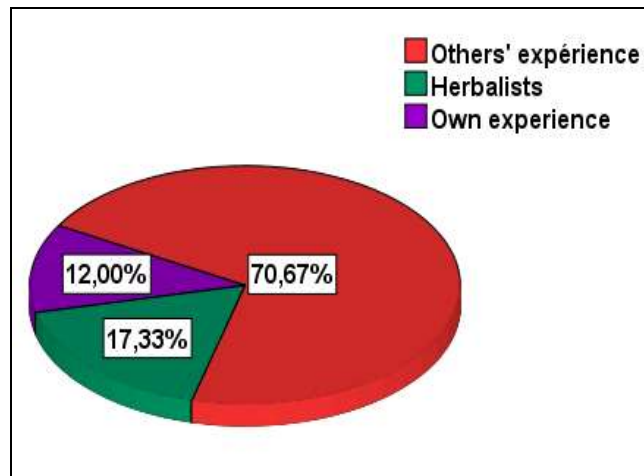


**Fig. 12:** Health outcomes after plant therapy

According to 44.66% of the surveyed, use of traditional remedies lead to a total cure. However, 54.85% of them affirm that these remedies improve health condition and 0.49% found that the remedies are ineffective (Figure 12). These results confirm those of other ethnobotanical studies carried out at the national level [11].

12) *Source of knowledge about medicinal plants:*

70.76% of the population acquired knowledge about medicinal use of plants as remedy for specific diseases through others' experiences (Figure 13). This reflects the relative transmission of traditional practices from a generation to the next one. 17.33% practice herbal medicine according to herbalists' advices and 12% had built this knowledge by reading books about traditional Arab medicine, by watching television programs or by their own experience with a large number of medicinal plants in their surroundings. The environment and others' experience remain therefore the most effective means to transmit knowledge about medicinal purposes of plants.



**Fig. 13:** Traditional knowledge acquisition modes

13) *Floristic catalog :*

Monographs of the inventoried AMP are presented by alphabetical order of the families and species. For each plant, the monograph contains the scientific name, the French name, the vernacular name, the part used and the local use (Table 4).

Table 4: Floristic catalog of AMP of Er-Rich

Family name	Scientific name of the species	Vernacular names (in French and Tamazight)	Local use
Amaranthaceae	<i>Chenopodium ambrosioides</i> L.	Ansérine -Mekhenza	Decoction of aerial parts is used against typhoid and gastrointestinal pain. The plant poultice is used to treat children in case of fever. Fresh leaves mixed with orange juice are also used for the same purpose.
	<i>Fredolia aretioides</i>	Chou-fleur du désert - Aknoud	Plant decoction is used to treat gastrointestinal diseases.
	<i>Hammada scoparia</i>	Saligne à balai-Tissait	Infusion or decoction of aerial parts is used against digestive pain.
Apiaceae	<i>Bupleurum atlanticum</i> Murb.	Buplèvre	Not mentioned
	<i>Carum carvi</i> L.	Carvi-karouia	Seed infusion is used for the treatment of gastrointestinal diseases.
	<i>Coriandrum sativum</i> L.	Coriandre -Kozbar	seeds decoction is used against kidney stones
	<i>Foeniculum vulgare</i> L.	Fenouil sauvage Besbasse	Infusion, decoction or seeds powder serve to treat gastrointestinal pain (diarrhea, nausea and colon pain)
	<i>Petroselinum sativum</i> Hoffm.	Persil des jardins- Maadnous	Decoction of aerial parts is used to treat urogenital ailments
Apocynaceae	<i>Nerium oleander</i> L.	Laurier –rose-Alili	Leaves infusion is used against diabetes.
Asteraceae	<i>Artemisia absinthium</i> L.	Absinthe-Chiba	Plant infusion is used against chills.
	<i>Artemisia herba-alba</i> Asso.	Armoise blanche-Ifsi	Decoction of aerial parts or leaves powder is used against digestive ailments and intestinal worms. This plant also serves as stomachic, anthelmintic and anti diabetes agent.
	<i>Anvillea radiata</i> Coss & Dur	Ajjirge (kramouch)	Not mentioned
	<i>Dittrichia viscosa</i> (L.)Greuter	Inule visqueuse- Terrahla	Leaves decoction and leaves powder are used against typhoid fever, diarrhea, diabetes and urogenital diseases. In fumigation, leaves are used against headaches.
	<i>Hertia maroccana</i> (Batt.) Maire	Garou -Alezzâz	Leaves powder is mixed with henna and olive oil for hair care (growth and softening).
	<i>Lactuca serriola</i> L.	Laituescarior-Tougha n'ssem	Leaves decoction serves against scorpion stings and snake bites (antidote).
	<i>Launaea arborescens</i> (Batt.) Maire	Launaea arborée- melbina	Latex of the plant can be used against boils
Brassicaceae	<i>Launaea laniflora</i>	Asnane	Not mentioned
	<i>Pulicaria mauritanica</i>	-Toufe telba	Infusion or decoction of aerial parts is used against fever, high blood pressure and diabetes.
	<i>Santolina rosmarinifolia</i> L.	Santoline-Ouezouaza	Decoction of flowers' heads is used as stomachic and anthelmintic agent.
	<i>Scolymus hispanicus</i>	Assnan	Not mentioned
	<i>Farsetia hamiltonii</i>	Zâazâa	Not mentioned
	<i>Moricandia suffruticosa</i>	awlgaz	Not mentioned
Buxaceae	<i>Zilla spinosa</i> subsp.castata	Pois chiche sauvage - Boukhelala	Not mentioned
	<i>Buxus balearica</i> Lam.	Buis des baléares - Azazer	Fruits powder with honey is widely used against stomach pain, colon pain and anemia.
Cactaceae	<i>Opuntia ficus indica</i> L.	Figuier de barbarie - lhendia	Seeds powder serves to treat stomach pain.
Capparaceae	<i>Capparis spinosa</i> L.	Caprier-Tailaloute	Fruits decoction and powder are used against chills and diabetes. Leaves poultice with olive oil is effective against back chills
	<i>Cleome arabica</i> L.	Cleome d'arabie- Toukhmejte	Not mentioned
Caryophyllaceae	<i>Herniaria glabra</i> L.	Herniaire glabre - Hrasset lehjar	In decoction, the whole plant is used against kidney stones.
Chenopodiaceae	<i>Atriplex Halimus</i> L.	l'arroche marine+Armas	Not mentioned
Cucurbitaceae	<i>Citrullus colocynthis</i> L.	Coloquinte-Taferzizte	Fruit half portion filled with some olive oil is used against rheumatism. The patient has to soak his feet in for a few hours. The fruit is also used to treat reproductive system diseases.
Cupressaceae	<i>Juniperus oxycedrus</i> L.	Genévrier cade- Taqqa	Not mentioned
	<i>Juniperus phoenicea</i> L.	Genévrier rouge- Taoualte	Leaves decoction serves against digestive ailments and osteoarticular diseases. Fruits powder is used to treat kidney diseases.

Euphorbiaceae	<i>Euphorbia nicaeensis</i> All.	Tanougha	Latex is used against alopecia.
Fabaceae	<i>Adenocarpus bacquei</i> Batt.et Pitard	Adenocarpus Aghoulmtte	Leaves decoction is used against chills and rheumatism
	<i>Ceratonia siliqua</i> L.	Caroubier –Tisslighwa (khrouba)	Seeds powder with honey is used against stomachaches.
	<i>Ononis natrix</i>	Awdach	Not mentioned
	<i>Retma sphaerocarpa</i> (L.)Boiss	retama amarilla-Algou	Poultice of roots powder with other plants is used for hair care
Juglandaceae	<i>Juglans regia</i> L.	Noyer- Douge	The fruit an antihypertensive agent.
Juncaceae	<i>Juncus acutus</i>	Jonc piquant -Azmou	Seeds decoction is used against digestive ailments.
Lamiaceae	<i>Marrubium deserti</i>	Marrube du désert	Not mentioned
	<i>Mentha pulegium</i> L.	Menthe pouliot- Fliyyo	Decoction of the whole plant is recommended to treat cold and cough . Infusion of the plant in milk or tea is indicated for cold and flu. It serves also to lower body temperature.
	<i>Mentha suaveolens</i> Ehrh.	Menthe à feuilles rondes_Timrssad	Leaves decoction is used against abdominal pain, chills and flu. The plant possesses insecticide properties.
	<i>Mentha viridis</i> L.	Menthe verte-Na'nae	Aerial parts infusion is used to treat stomach pain.
	<i>Origanum majorana</i> L.	Marjolaine à coquilles –merdedouch	Plant infusion is much used as sedative, antispasmodic and warming agent
	<i>Rosmarinus officinalis</i> L.	Romarin-Assir	Leaves decoction and flowering tops are orally used to treat digestive disorders, tiredness, headaches, rheumatic pains and painful menstrual periods. The plant decoction associated with 38e ais reputed to be a tonic. Plant essential oil is used against foot eczema and chills.
	<i>Salvia officinalis</i> L.	Sauge-Salmia	Leaves infusion is used against hypertension..
	<i>Thymus satureioides</i> L.	Thym-Azoukni	Aerial parts decoction or infusion is used against gastrointestinal ailments, cold, fever, chills, headaches, digestive infections and menstrual period pain. In addition, in fumigation, its is used against respiratory diseases, digestive ailments. It is also an antispasmodic agent.
	<i>Teucrium fruticans</i> L.	Germandrée arbustive – Mirou	Leaves decoction is used against chills
	<i>Teucrium mideltense</i>	Attimeloul	Leaves decoction or infusion is used against digestive ailments.
Lythraceae	<i>Punica granatum</i> L.	Grenadier –Erramane	Powder of the fruit peel is recommended against stomachaches
Myrtaceae	<i>Eucalyptus grandis</i>	Kalitous	Decoction of leaves is used against respiratory problem.
	<i>Tetraclinis articulata</i> (Vahl) Masters	Aaraar	As poultice leaves are used on the head against fever and the leaves powder is used against abdominal ailments and cold.
Nitrariaceae	<i>Peganum harmala</i> L.	Harmel-Alharmel	Seeds powder mixed with olive oil and henna is used as hair loss treatment. Seeds macerate in olive oil is used, in poultice, for the treatment of rheumatism and joint pain.
Oleaceae	<i>Olea europaea</i> L.	Olivier – Zitoune	Leaves infusion and macerate are used against high blood pressure and diabetes. Olive oil is widely used for the treatment of ear infections.
Pinaceae	<i>Pinus halepensis</i> Mill.	Pin d'Alep-Tayda	Not mentioned
Poaceae	<i>Arundo donax</i>	Canne de Provence-Aghanime	Roots powder is used as hair loss treatment.
	<i>Avena sativa</i>	Elkhrtaal	Seed decoction is used against diabetes and cholesterol
	<i>Stipatena cissima</i> L.	L'alfa-Agouri	Decoction of aerial parts is used for diabetes.
	<i>Zea mays</i> L.	Mais- Dra	Decoction of corn silk is used against urinary system diseases
Rhamnaceae	<i>Ziziphus lotus</i> (L.) Lam	jujubier sauvage-Azouggar	Fruit powder with honey is widely used against stomach pain, colon pain and anemia.
Rosaceae	<i>Crataegus monogyna</i> Jacq.	Aubépine monogyne – Admâm	Fruit powder is used for the treatment of gastrointestinal diseases.
	<i>Crataegus laciniata</i> Ucria.	Aubépine –Tabgha	Flower infusion is used to treat diarrhea and heart palpitations. Fruit decoction is consumed to treat anxiety.
	<i>Rosa damascena</i> Mill.	Lward	Flowers decoction is used against gastrointestinal and urinary problems
Rubiaceae	<i>Rubia tinctorum</i> L.	Garance à des teinturiers- Taroubia	Root decoction is used against anemia
Rutaceae	<i>Ruta montana</i> L.	Rue sauvage-Iwrmi	Infusion of aerial parts is orally or externally used

			against respiratory ailments, gout, edema, paralysis and headaches. Plant fumigation of the associated with harmel is used to treat epilepsy.
Steraceae	<i>Taraxacum officinalis</i> F.H.Wjgg	Iwjtem	aerial part is used as food
Tamaricaceae	<i>Tamarix africana</i>	aarich	Not mentioned

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### Appendix I: Questionnaire sheet on the uses of medicinal plants

Place : ..... Dated : .....

#### Informants details

1. Sex: Male  Female
2. Family situation: Single  Married
3. Level of study: Illiterate  Primary  Secondary  University
4. Profession : .....
5. Age: .....

#### The medicinal plants used by informants

Are you a user of medicinal plants:

Yes : ..... No: .....

➤ If not why ?

.....

➤ If yes, What are the medicinal and aromatic plants you use?

1. Medicinal species : Vernacular name :.....

Scientific name :.....

2. Plant usage : Therapeutic, Cosmetic, Other

3. Used part of the plant : Stem; Flowers; Fruist; Seeds; Bark; leafs; Whole plant ; Aerial part ; Latex ;

Stigma

4. Preparation mode : Infusion ; Decoction ; Maceration ; Fumigation Powder ; Poultice ; Wine ; Cooked ;  
Essential oil

5. Administration mode : Oral ; Massage ; Rinsing ; Painting ; Other

6. Diagnostic : Based in experience of the others ; herbalist ; Doctor ; Other

7. Type of disease treated : Dermatological affections; Respiratory affections; Cardiovascular affections;  
Genitourinary diseases; Metabolic disorders ; Digestive system disorders ; Neurological affections; Renal  
disease ; Hair care ; Others.

8. Origin of the information :

9. Results : Healing, Improving, Ineffective

10. Toxicity : No ; Yes :.....

11. Side effects: No; Yes: .....