

Ethnobotanical Survey of Local Medicinal Plants in the Urban District of Khenifra – Morocco

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ABSTRACT: Within the framework of enhancement of plant biodiversity and traditional phytotherapy of Medicinal and Aromatic Plants (MAP) in Morocco, an ethnobotanical survey was carried out in the urban district of Khenifra in order to identify the medicinal plants used by the local population and their therapeutic uses. This investigation was done in two campaigns, between March and July during 2013 and 2014, with diverse informants (simple users, herbalists, collectors and farmers). 180 question card were filled by information about the medicinal plants used, the part used of the plant, the mode of preparation and the treated diseases. Samples of plants were identified in the scientific institute of Rabat. The survey concerned informants of both sexes (Woman 51 % and Man 49 %). More than 50 % of the interviewers are between 30 years old and 50 years and have, in the majority, a level of primary (33 %) or secondary schooling (33 %). This survey has brought to light 45 local medicinal plant of which the following plants were cited by more than 50% of the interviewers: *Thymus sp* (91,67%), *Mentha suaveolens* (67,22)%, *Origanum vulgare* (66,11%), *Mentha pulgium* (62,87%). The medicinal plants belong to 17 families where the most presented families are *Lamiaceae* with 17 species (37,78%) and *Asteraceae* with 10 species (22,22%). The major diseases treated by the population are related to digestive system (28%) and respiratory system (17%). The most used part of the plant is Leaf (36%) or Aerial part (32%) followed by Flowers (13%) and Root (13%) and finally Seed (6%). The most used preparation is Infusion (36%) then Decoction (33%). Medicinal plants are mainly spontaneous 91% while only 9% are cultivated. This study allowed us to inventory the spontaneous or cultivated medicinal plants in the district of Khenifra, determine their vernacular and scientific names and identify the cultural heritage on the various therapeutic uses of these plants practiced by the local population.

KEYWORDS: Ethnobotanical survey, medicinal plants, traditional uses, Khenifra (Morocco).

I. INTRODUCTION

Plants have always been a common source of medicament, either in the form of traditional preparation or as a pure Active Principles. Indeed, Medicinal Plants and their knowledge are the base of traditional medicine, and they represent, for modern medicine too, a source of potentially important new Active Principles and pharmaceutical substances [1]. In the last decades, the use of plants for healing knew a dramatic increase and the interest reached to medicinal plants does not stop growing all over the world, as well in developed and developing countries [2].

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Ethnobotanical survey has been found to be one of the reliable approaches to conservation of traditional medicine knowledge. They bring information on the therapeutic uses of plants from which the researchers can base and use in their research to develop new bioextracts or molecules of interest.

MOROCCO is a Mediterranean country of North Africa with a particular geographical situation that conferred the country diverse weather conditions and specific grounds favorable to the development of a rich and varied flora, such as the sector of the medicinal and aromatic plants (MAP) which is one of the richest in the world. Indeed, the natural ecosystems of Morocco contain more than 41 ecosystems and 7000 botanical species among which 4500 species of vascular plants. Among this floral diversity, 600 species are known for their aromatic and medicinal uses [3]. At present, Morocco is classified 12th world exporter of MAP. This diversity of medicinal plants has been used since a long time in the Moroccan pharmacopoeia [4], so Moroccans have a legacy in the use of medicinal plants in the folk medicine which still widely used.

Moroccan phytotherapy knew recently a big interest, and several ethnobotanical surveys were carried out in several regions of Morocco with the aim of establishing an inventory of medicinal plants and identifying and recording their local medicinal traditional knowledge. In deed, surveys conducted in regions of the center of Morocco, such as Tounate [5], Fez [6], El Hajeb [7] Meknes [8] and Ain leuh [26], allowed to inventory more than hundred medicinal plants with a dominance of the family Lamiaceae. The wealth in healing plants of western Morocco and the region of Gharb, known by their approximation to the forest Maâmora, was proved by studies conducted in Rabat [9, 10], Kenitra [11] and Mechraa bel ksiri [12]. In this region the studies noted the dominance of the family Astaraceae [10, 12]. Other ethnobotanic studies concerned other regions as Rif [13] eastern Morocco [14] and in the South-east of Morocco: Essaouira [15, 16] and Tata [17]. These studies registered a wealth and a variety of the medicinal flora as well as a Moroccan pharmacopoeia in these regions.

In Khenifra province, several ethnobotanical studies were realized with the purpose to contribute to the valuation of the plant biodiversity and the local phytotherapy of the mentioned region. Thus *Daoudi Amine and al* [18] inventoried a hundred species of medicinal spontaneous plants in the rural district of Aguelmous, and *Hannou Zerkani and al* [19] studied the medicinal flora of rural districts Ait Ishaq, Tighssaline, El Hammam and Aguelmam azegza.

In this work, we realized an ethnobotanical study in the urban district of Khenifra with the aim of inventorying medicinal plants, spontaneous or cultivated, used by the local population, identifying their scientific names and recording their therapeutic uses by specifying the part used of the plant, the type of preparation and the handled pathology. The digital analysis of the collected information led us to determine the most used medicinal plants and which, afterward, undergo a strong pressure of picking.

II. MATERIALS AND METHODS

II-1- STUDY AREA

Province of Khenifra depends on Beni Mellal - Khenifra region (figure 1). It appertains to both geographic zones The Middle Atlas and The Central Plateau and occupies a relay place between two rich agricultural regions Saïs and Tadla. Its area is about 67134 Km² where the forest occupies 264374ha (39% of the area of the province) and play a very important role in the development of the socioeconomic tissue of the Province [20].

Province of Khenifra was always considered as the water tower of Morocco by the lakes and three big hydraulic ponds have their sources in this province: Oum Errabia river, Bouregrag river and Sebou river. The population of Khenifra province is, at 46,16%, rural and 60,9% of the population is in the average of age between 15 to 59 years old. The illiteracy rate for population over 10 years old is 54% (Census HCP 2014) [21].

Khenifra district, an urban district of Khenifra province and the biggest one, It is crossed by Oum Errabia river and surrounded by mountains, its climate is characterized by a rainy and cold winter with periods of snow in the high mountains, and a hot dry summer with storm periods.

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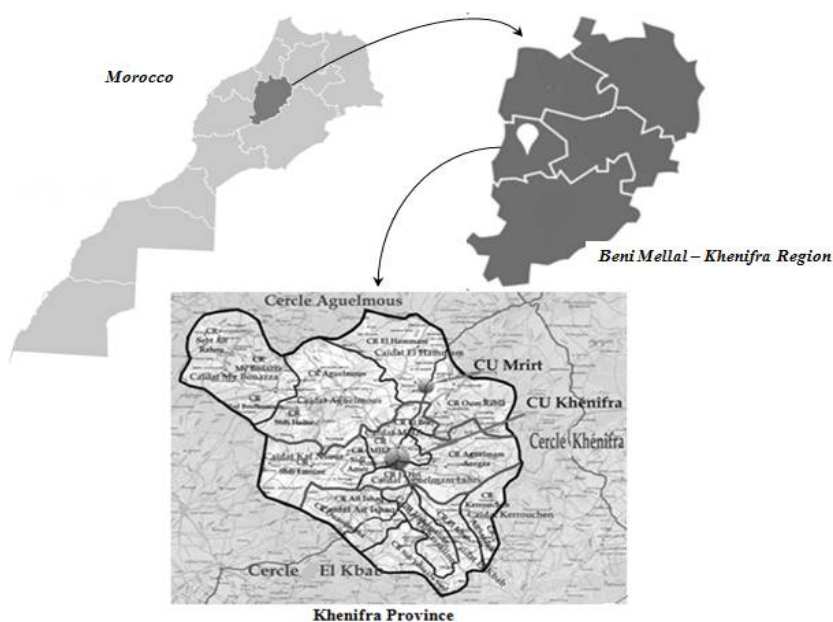


Fig 1 : Map of the Khenifra province and location of the zone of study

II-2- ETHNOBOTANICAL SURVEY

The ethnobotanical survey was carried out in two campaigns, between March and July during 2013 and 2014 and was conducted in several places of Khenifra district (weekly souks, central and permanent souk, douar, traditional and modern stores of sale) where we contacted herbalists, collectors, producers, farmers and simple users. In another had, we contacted Preservation and Development of Forest Resources Center, political authorities, the agricultural institute and also associations and cooperatives which work in the field of the valuation of medicinal and aromatic plants in order to collect more information. The investigation was realized through 180 cards questionnaires and samples of plants were collected, pressed in Herbarium and identified in the scientific institute of Rabat.

II-3- DATA PROCESSING

The information registered on the question cards were transferred in a database on Excel and handled by the software of statistical processing SPSS.

III. RESULTS AND DISCUSSION

III-1- PROFILE OF SURVEYED

The investigation was realized through 180 question cards filled by the information supplied by interviewees of both sexes, in various ranges of age and having different levels of schooling.

Distribution of surveyed by gender

The survey concerned people of both sexes with close percentages (figure 2). The male interviewees are mainly herbalists and collectors (61 %), farmers represent 11 % and male simple users represent 28 % (figure 2).

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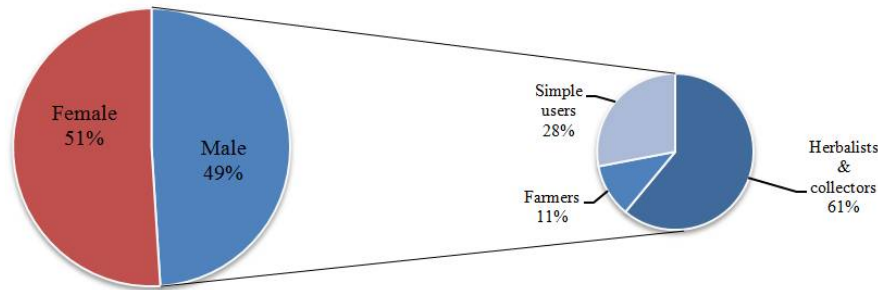


Fig 2: Distribution of surveyed by gender

Male interviewees are concerned as much as women by the use of the healing plants in the urban district of Khenifra, while in the rural districts of the same province, women presented a percentage of use of MAP higher than men [19]. This is due to the fact that in the urban sites, the tasks are divided fairly between men and women, collectors, herbalists and farmers are mainly men and simple users are mainly women who are more holders of the knowledge of traditional phytotherapy.

Distribution of surveyed by age class

The age of the questioned population was divided in six intervals (figure 3). Interviewees between 30-40 years and 40-50 years old represented respectively 28 % and 25 %, followed by the age ranges [20-30], [50-60] with respectively 19 %, 12 %, and finally those of less than 20 years and more than 60 years with 8 % for each.

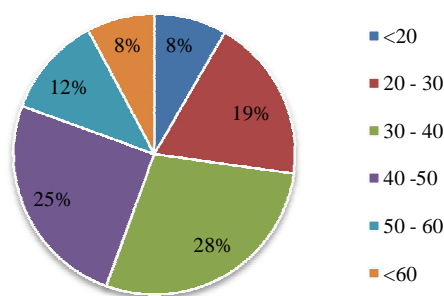


Fig 3: Distribution of surveyed by age class

The use of medicinal plants concerns all the age ranges with a wide dominance of population with the age between 30 and 50 years because it represents more than 50 %, while it is weak for people with age less than 20 years and more than 60 years. These observations are similar to those observed in a study in the city of Meknes [8]. This choice for the young people of less than 20 years old can be explained by the lack of information which they have on the importance of healing plants and not to believe too much in traditional medicine. For people with the age more than 60 years old, this observation is explained by the fact that the diseases which appear in this age can be complicated and require intense treatments [8].

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Distribution of surveyed by level of education

The interviewed people had different levels of schooling (figure 4). They were illiterate at 18%, 33 % had a primary schooling level and 33 % had a secondary schooling level, while the university level is represented only by 16 % of the interviewees.

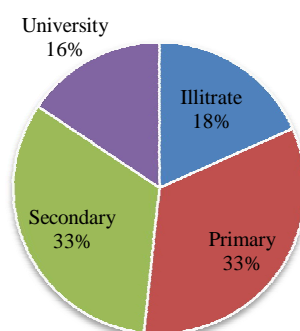


Fig 4: Distribution of surveyed by level of education

The consulted population was schooled in 82 % and in 49 % with a secondary level at least, which is closely linked to its age mainly below 50 years old. This percentage of schooled population is raised with compared with other studies carried out in rural districts of the same province [18, 19] where a big percentage of users of medicinal plants were illiterates. It shows that, in the urban district of Khenifra, the use of medicinal plants is not restricted to the illiterate people; on the other hand, their use has renewal attention and interest for the schooled people who began to restore confidence in traditional medicine.

III-2- INVENTORIED AROMATIC AND MEDICINAL PLANTS

List of Inventoried Aromatic and medicinal plants

The information collected during this study: scientific and vernacular names of the plants, the parts used of the plant, the mode of preparation and the therapeutic indication are grouped in table1.

Plant name	Local name	Part used	Mode of preparation	Therapeutic use
Anacardiaceae				
<i>Pistacia lentiscus</i>	طرو	Leaf Resin	Decoction Chewing Powder	Digestive pains Tooth care Burn of skin
Asteraceae				
<i>Artemisia herba-alba</i> (A. <i>inculta</i>)	الشبح	Aerial part	Decoction	Rheumatic pains, Intestines
<i>Artemisia arborescens</i>	الشبية	Leaf	Infusion	Stomach pains
<i>Anacyclus pyrethrum</i>	إكنص	Root	Decoction	Rheumatic pains, digestive disorder and oral infections
<i>Anacyclus clavatus</i>	البابونج	Flower	Infusion	Hair car and coloration, sedative
<i>Carlina gummifera</i>	الداد	Root	Powder	Skin abscesses Burn of skin
<i>Dittricia viscosa</i>	المخينة	Leaf	Maceration(External use)	Fever and head ache

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			<i>Decoction</i>	Ovarian and menstrual pains
<i>Inula helenium L</i>	تراهلا	Leaf	Placed externally Decoction	Astringent and antiseptique Stomach and intestines
<i>Cynara sp</i>	تيمط	Aerial part	<i>Powder</i>	Burn of skin
<i>Sonchus sp</i>	ربيعة السم	Leaf	<i>Powder, maceration</i>	Against insectes poison
<i>Calendula sp</i>	الجمرة	Flower	<i>Maceration</i>	Anti-inflammatory, scarred skin
Lamiaceae				
<i>Lavandula ssp</i>	الخزامى	Leaf	<i>Infusion</i>	Diabetes, cough Rheumatic pains Urinary system
		Seed	<i>Fumigation</i>	
<i>Lavandula multifida</i>	الكحيلة	Leaf	<i>Infusion</i>	Stomach aches
<i>Rosmarinus officinalis</i>	أزير	Leaf	<i>Decoction</i>	Intestines gaze, Urinary system
			<i>Maceration (externally use)</i>	Muscular pains, rheumatism pains
<i>Mentha pulgium</i>	قليو	Aerial part	<i>Infusion</i>	Cold, respiratory canals and cough
<i>Thymus sp</i>	الزعتر	Aerial part	<i>Decoction</i>	Digestive pains
<i>Mentha suaveolens</i>	مرسطة	Aerial part	<i>Decoction</i>	Common colds
<i>Ajuga iva L</i>	الشندكورة	Aerial part	<i>Decoction</i>	carminative Stomachi and rheumatic pains,
<i>Salvia lavandulifolia</i>	السالمية	Leaf	<i>Decoction</i>	Diabetes , Intestines
<i>Origanum majorana L</i>	مردوش	Aerial part	<i>Decoction</i>	Gastric pains and headache rheumatism
<i>Lavandula stoechas</i>	الحلال	Flower	<i>Infusion</i>	Rheumatisms, Diabetes
<i>Teucrium polium</i>	الجعية	Aerial part	<i>Decoction</i>	Liver pains Tooth pains
<i>Marrubium vulgare</i>	مريوة	Aerial part	<i>Infusion</i> <i>Powder</i>	Bronchits, cough and cold Ear pains
<i>Merrubium sp</i>	مرو	Aerial part	<i>Infusion</i>	Spasmolytic
<i>Origanum</i> <i>Origanum ulgaris</i>	الزعتر	Aerial part	<i>Decoction</i> <i>Poudre</i>	stomach and intestinal pains stomach pains
<i>Mentha</i>	مانتا	Leaf, Flower	<i>Infusion</i>	Common colds
<i>Ajuga iva</i>	توف الطلبة	Aerial part	<i>Fumigation</i>	Head ache
Myrtaceae				
<i>Eucalyptus</i>	كاليتوس	Leaf	<i>Infusion</i> <i>Inhalation</i>	Typhoid Asthma and common colds and nose infection

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<i>Myrtus communis L</i>	الريحان	Leaf, Flower	Powder Infusion	Hair care Diarrhoea and pneumonia
Rosaceae				
<i>Rosa sp</i>	الورد	Flower,	Infusion, Powder Infusion	Skin Face Intestinal pains
Verbenaceae				
<i>Verbena spp</i>	اللوزية	Leaf	Infusion,	Facilitate the falling asleep
Thymelaeaceae				
<i>Daphne gnidium</i>	الزراز	Leaf	Décoction, Powde	Hair car
Cupressaceae				
<i>Tetraclinis articulata</i>	العراعر	Leaf	Fumigation Infusion	Cough and asthma Intestines gas and stomach
Euphorbiaceae				
<i>Carralluma enropaea</i>	الدغموس	Leaf	Maceration	Kystes
Caryophyllaceae				
<i>Corrigiola telephiifolia Pour</i>	سرغينة	Root	Decoction Infusion	Lung disorder Rheumatic pains
<i>Herniaria cinerea DC.</i>	هراسة الحجر	Aerial part	Decoction	To pass kidne and pancreas stones
Papaveraceae				
<i>Papaver cf.rhoeas</i>	بلعمان	Flower, seed	Decoction	Analgesic, insomnia
Capparaceae				
<i>Capparis spinosa</i>	الكبار	Root	Infusion	Digestive pains Head ache
Apocynaceae				
<i>Nerium oleander</i>	الدفلة	Root	Infusion	Calefacient and diuretic abortfacient
Mimosaceae				
<i>Albizia sp</i>	الخروب	Fruit Leaf and Root	Powder Decoction	Stomachic and intestins Kidney stones and diarrhoea
<i>Quercus ilex</i>	أمريس	Leaf	Infusion	Anaemia, Jaundice
<i>Cistus ladaniferus</i>	توزالت	Leaf	Infusion	stomach
<i>Ferula communis</i>	اليوبال	Flower	Decoction	Stomachic aches
<i>Foeniculum</i>	البسباس	Root, Arial part	Decoction	Digestif system pains, Intestines gaze

Distribution of plants according to families

This study allowed us to identify 45 medicinal plants used by the local population in traditional medicine. These plants belong to 17 families: Lamiaceae with 17 spices (37,78%) and Asteraceae with 10 spices (22,22%). The other represented families are Apiaceae, Caryophyllaceae and Myrtaceae with two spices (4,44%) each, and finally

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Anacardiaceae, Apocynaceae, Capparaceae, Cistaceae, Cupressaceae, Euphorbiaceae, Fagaceae, Mimosaceae, Papaveraceae, Rosaceae and Thymeleaceae with one spice (2,22%) each.

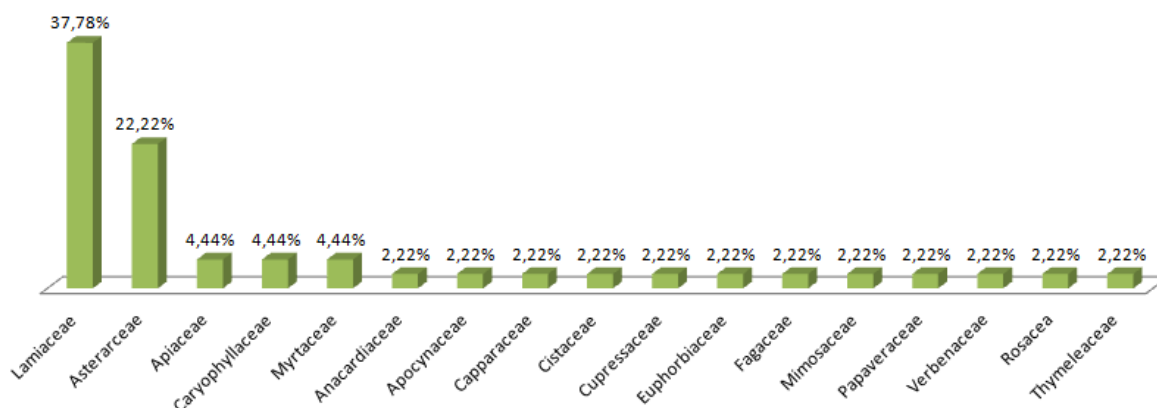


Fig 5: Distribution of plants according to families

The most represented families are Lamiaceae and Asteraceae. They are the same families most represented in other ethnobotanical studies realized on a national scale [10,18,19]. Other studies, realized in Meknes, Beni Mellal and the South of Morocco in Tata, recorded also an important presentation of the families Apiaceae and Fabaceae besides Lamiaceae and Asteraceae [8, 17, 22].

Distribution of plants with high frequency of use

The statistical analysis of the data collected during this study drove to the following results: the first ten plants which present the highest frequencies of use are: *Thymus sp* (91,67%), *Mentha suaveolens* (67,22)%, *Origanum vulgare* (66,11%), *Mentha pulgium* (62,87%), *Rosmarinus officinalis* (46,67%), *Tetradlinis articulata* (44,44%), *Salvia lavandulifolia* 42,22%), *Lavandula ssp* (33,89%), *Caralluma europaea* (28,33%) and *Origanum majorana* (25%). As shown in figure 6. (The frequency of use represents the percentage of the number of the interviewees having quoted the plant with regard to the total number of the interviewees)

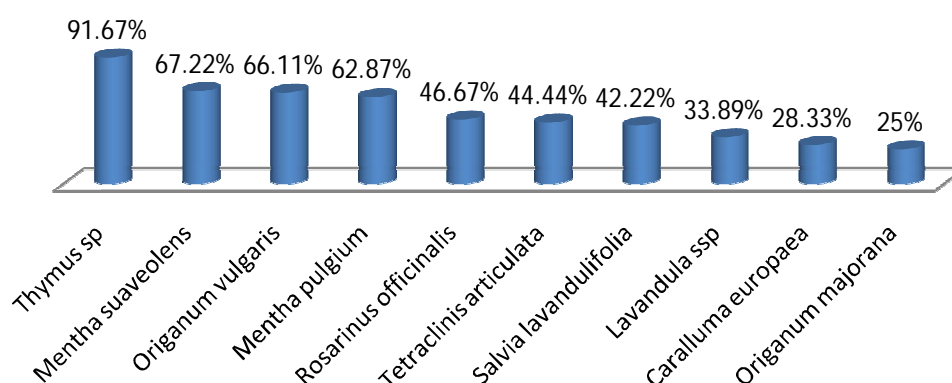


Fig 6: Distribution of plants with high frequency of use

Thymus sp is the plant the most used by the population questioned during this survey. This result suits to that found in a similar study in the nearby municipalities, in addition seven among these ten plants also had high frequencies of use [19]. This is due to the geographical and cultural approximation between these municipalities.

Distribution of plant source

Medicinal plants inventoried in this study were spontaneous in a great majority (figure7)

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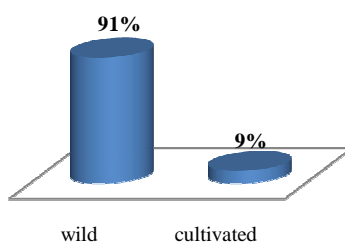


Fig 7: Distribution of plant source

91% of the plants are wild and 9% are cultivated. We noted that main actors which operate in the sector of Medicinal and Aromatic Plants by exploiting and marketing the potentially available and cultivate species in the area are the farmers, the collectors, herbalists besides associations and cooperatives. But the most concerned by the culture of MAP are mainly associations and cooperatives [23, 24]. These results show the strong pressure of exploitation of the spontaneous flora which can cause its erosion and its extinction

III-3- THERAPEUTIC USE OF MEDICINAL AND AROMATIC PLANTS

Figures 8, 9 and 10 represent respectively the distributions of the plants parts used, the pathologies treated and the plant preparation types.

Distribution of the plants parts used

Leafs and aerial parts of medicinal plants are the most used parts, and they represent respectively 36 % and 32 % (figure 8), come then roots and flowers with 13 % each, while the use of seeds represents only 6 %.

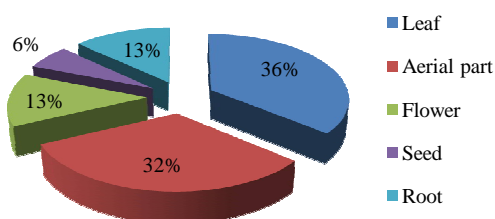


Fig 8: Distribution of the plants parts used

The high frequency of use of leafs can be explained by the fact that they are the seat of the photosynthesis and sometimes the storage of the secondary metabolites responsible for biological properties of the plant [8, 25].

Distribution of pathologies treated by medicinal plants

We distributed the diseases handled by plants in six domains: digestive system, respiratory system, circulatory system, skins and hair, rheumatism and others which include nervous system, diabetes, teeth and gums and urinary system. The distribution of these domains is presented in the figure 9.

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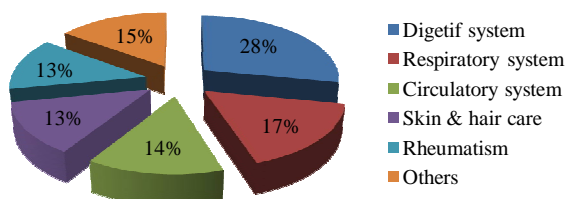


Fig 9: Distribution of pathologies treated by medicinal plants

An important percentage is connected with the diseases caused by cold: rheumatism and diseases of the respiratory system, it's due to the geographical and climatic conditions of the region, as already quoted, very cold in winter, besides the living conditions characterized by poverty.

Distribution of plant preparation types

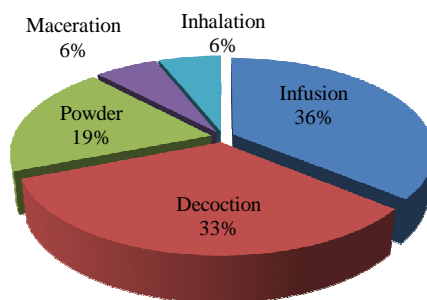


Fig 10: Distribution of plant preparation types

For the plant preparation types (figure 10); infusion and decoction constitute the most frequent preparation type (36 % and 33 % successively). Other preparations are also used such as Powder (19 %), Maceration (6 %) and Inhalation (6 %). Similar observations were made by other authors who studied the Moroccan pharmacopoeia [7, 11, 17].

IV. CONCLUSION

This study allowed us to identify the medicinal plants of the urban district of Khenifra and to record their therapeutic uses by the local population. Men and women have fairly a knowledge on the use of medicinal plants, men mainly as herbalists and collectors and women mainly as simple users. The medical treatment by plants is not restricted to the illiterate people, on the other hand, the schooled people restored confidence in traditional medicine with plant thanks to its efficiency and its low cost. Indeed, in Morocco, some local TV and Radio programs influenced on the population and directed people to the benefactions of medicinal plants. But this caused an increase of the request of medicinal plants and then a strong pressure of picking by collectors, this picking is made in a not conservative way and before the blooming, which had for consequence the degradation of certain spontaneous and endemic species. The installation of a national program to show the best practice of collection and encourage the culture of plants turns out to have big importance.

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