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ETHNOBOTANICAL STUDY OF AROMATIC AND MEDICINAL PLANTS USED IN TRADITIONAL PHYTOTHERAPY IN MIDELT REGION OF MOROCCO

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ABSTRACT

The aim of this study is to identify the medicinal virtues of aromatic and medicinal plants (AMPs) used in traditional phytotherapy by the local population, this ethnobotanical study was carried out among the population in the Midelt province (Morocco) based on questionnaires and ethnobotanical surveys conducted during four months of fieldwork from May 2022 to the end of August 2022. The first part concerns the informant and the second concerns the species used in the disease treatment. A total of 100 people, 68 women and 32 men were interviewed and only herbalists and traditional therapists were selected for this study. The ages of population ranged between 20 and more than 60 years, of which illiterate women dominate with a percentage of 50 % and men with a higher level of education dominate with a percentage of 43.75 %. This survey yielded 66 plant species grouped into 30 different families, of which the Lamiaceae genus was the most abundant. Treatments were mostly prepared by decoction with a percentage of 46.17%. Plant species were used absolutely in the treatment of gastrointestinal infections with a percentage of 25.42% followed by respiratory infections (13.13%) using exclusively the by oral administration (58.95%). These promising results constitute a crucial reference for the studied region and for the national medicinal flora and therefore a database to research of new natural substances.

Keywords: Aromatic and medicinal plants, Ethnobotanical surveys, Phytotherapy, Traditional medicine.

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INTRODUCTION

Since the earliest times, aromatic and medicinal plants (AMPs) have been known for their use in traditional medicine, where wild plants play a crucial role in phytotherapy (Dibong *et al*., 2011). In developing countries, the World Health Organization estimates that traditional medicine covers the primary health needs of 80 % of their population. (Bousta and Ennabili, 2011). In the Maghreb (North Africa), phytotherapy still plays a very important role in traditional medicine (Bellakhdar, 2006). Morocco is one of the Mediterranean countries with a long history in traditional medicine using AMPs (Scherrer *et al*., 2005). Indeed, several researchers are interested in the inventory and identification of AMPs used in different regions (El Alami *et al*., 2016); in the Eastern High Atlas (upper Moulouya), a floristic and ethnobotanical study of the medicinal flora was carried out (Benlamdini *et al*., 2014).

Ethnobotanical study to explore the medicinal flora of the Midelt (Morocco) is unexpolred. It is one of the richest regions with medicinal plants highly resistant to cold and frost. These species constitute a phytopharmacy of the local population. In addition, Midelt region is one of the most biologically diverse regions of Morocco and the source of many AMPs (such as *Rosemary, Juniper*…) marketed throughout the country as well as abroad.

The aim of our study is to carry out an ethnobotanical survey in order to identify the AMPs used in traditional medicine by the local population, the mode of use and the therapeutic virtues of each plant species.

MATERIALS AND METHODS

Study area: The study was conducted in three villages in the province of Midelt: Ait Ayache, Amersid and Boumia, in addition to Midelt City, as illustrated in fig.1. Midelt is a part of Draa Tafilalet region, and hydraulically of the Melouiya watershed. It is bounded on the north by province of Ifrane, east by the province of Boulmane and Figuig, south by the province of Errachidia, and west by the province of Khenifra (Figure 1).

From the geographical and geological point of view, this region is located at the foot of Mount El

Ayachi (at an altitude of 3750 m) and enclosed between the mountain ranges of the Middle and High Atlas, with a geographical position characterized by a very rugged relief and altitude ranging from 1400 to 1800 m above the sea.

The geographical area of this region covers an area of 329,000 Ha, including 45,000 Ha of agricultural area (27,830 Ha Bour and 17,171 Ha irrigated) and consists of 22% mountainous areas, 71% hills and plateaus, and 7 % basins located in the Outat, Ansegmir, Amersid and Itzer perimeters. (Provincial Monograph, 2009; General Monograph, 2015; Monograph of the Midelt province, 2020).

Species taxonomic identification: Respondents and traditional therapists were interviewed on the basis of their ability to identify a particular plant by its vernacular name in Arabic or Tamazight, and a group of herbalists were visited to find out more about these plants.

In terms of taxonomy, species were identified using the manuals of determination of the vascular plant "Flore Pratique du Maroc" (Fennane *et al*.,1999; Fennane *et al*., 2007a; Fennane *et al*., 2007b).

All the scientific names and families of the species were revised using the two websites "Plants of the World online ";HTTPs//www.worldfloraonline.org/ and https://powo.science.kew.org/.

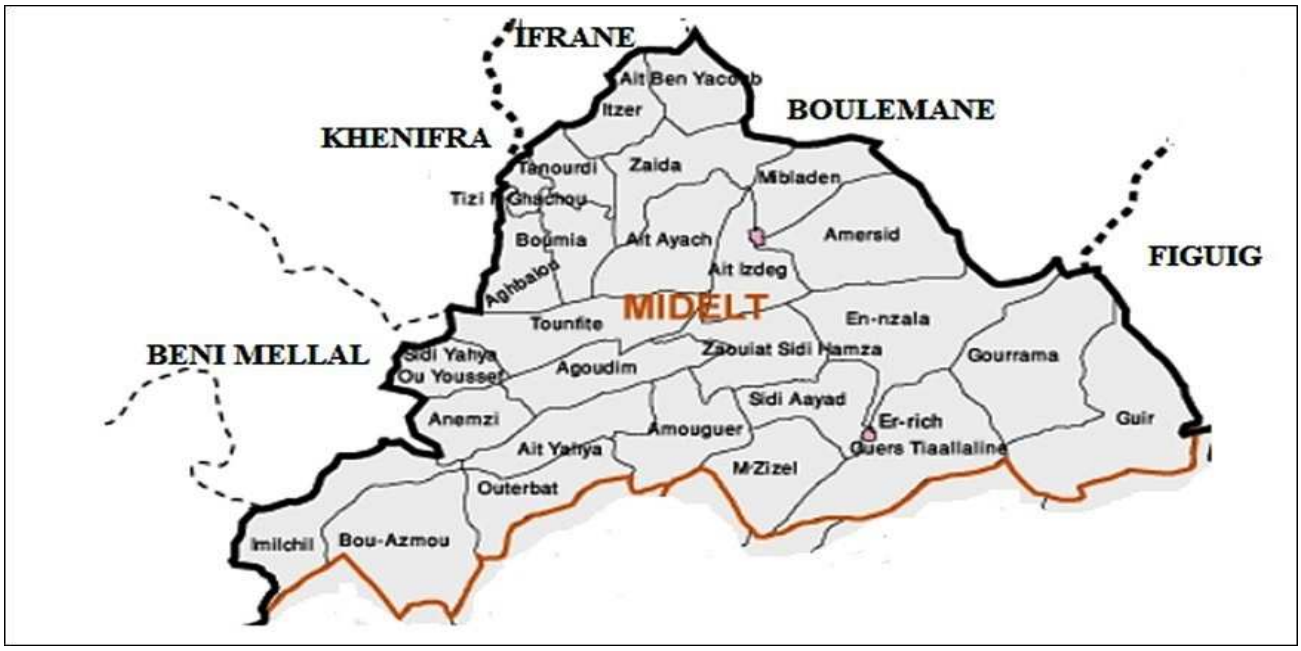

Figure 1: Geographical card of Midelt province – Morocco

Data collection: Basing on the questionnaire sheets, ethnobotanical surveys were conducted during 4 months from May 2022 to the end of August 2022. Information relating to the use of aromatic and medicinal plants was obtained through face-to-face interviews based on the questionnaire made with the local population of Midelt region (Morocco) in three villages: Ait Ayache, Amersid and Boumia, in addition to the Midelt city. The study targeted local herbalists and traditional therapists in the study area.

A total of 100 people carefully answered the questionnaire, while 56 others were excluded on the basis of a number of criteria described in the next paragraph.

The survey questionnaire is based on various questions, divided into two parts, the first relating to the herbalist or traditional therapist (age, gender, level of education), and the second to the aromatic and medicinal plants used for treatment (Name of plant species, Pathology for which these plants are used, Parts used, Method of preparation, Method of administration).

Inclusion and exclusion criteria: A set of criteria was used in this study to include or exclude informants, as follows:

Inclusion criteria: The inclusion criteria were based on the reputation of the informants with regard to herbal medicine, their knowledge of the types of plants used and their prolonged stay in the region.

Exclusion criteria: Informants who did not have sufficient information on the plants used, who did not practice herbal medicine and who were not in the study area or had not lived there for a long time were excluded.

Data analysis: The data recorded on the survey sheets were subjected to statistical analysis using the Microsoft Excel 2010 software. Thus, quantitative variables are

described using the mean values. Qualitative variables are described using counts and percentages.

Use value: The use value index (UV) is used to assess the relative importance of each plant species known locally to be used as an herbal medicine. The use value was calculated according to the following formula (1), where UV is the use value of a species; U refers to the number of citations per species; and N is the number of informants who reported on the plant species.

$$UV = \frac{U}{N} \quad (1)$$

Fidelity level: The fidelity level (FL) was calculated according to the formula (2) where Np is the number of informants reporting use of a plant species to treat a particular disease and N is the total number of all informants who reported all uses of a given plant species. (Ahmad *et al*., 2018).

$$FL(\%) = \frac{Np}{N} \times 100 \quad (2)$$

Informant consensus factor: Informant consensus factor (ICF) was employed to indicate how far the information is homogeneous. The ICF was calculated according to the formula (3). The Nur refers to the total number of use reports for each ailment category and Nt is the number of taxa used in that category (Heinrich and al., 1998)

$$ICF = \frac{Nur - Nt}{Nur - 1} \quad (3)$$

RESULTS AND DISCUSSION

Use of aromatic and medicinal plants according to the sex: In our survey, a total of 100 herbalists and tradithérapeutes in the region were selected for the study on the basis of a number of criteria described in the inclusion and exclusion criteria paragraph. Women represented 68 of the studied population compared to 32 of men (figure 2).

This can be explained by the fact that women are traditionally the custodians of the secrets of medicinal plants. Heirs to a rich family knowledge, through the transmission of knowledge, they testified above all, knowledge adapted to their family and their needs (Aquaron, 2005). These results are consistent with those obtained by (Tlemcani *et al*., 2023) in the Fes-Meknes region, (El Yaagoubi *et al*., 2023) in the middle atlas and the plain of Saiss, By (Benlamdini *et al*., 2014) in the region of Eastern High Atlas (Haute Moulouya), and by (Benkhnigue, 2010) in the region of Mechraâ Bel Ksiri, and (Mehdioui and Kahouadji, 2007) in the forest of Amsittène (Province of Essaouira).

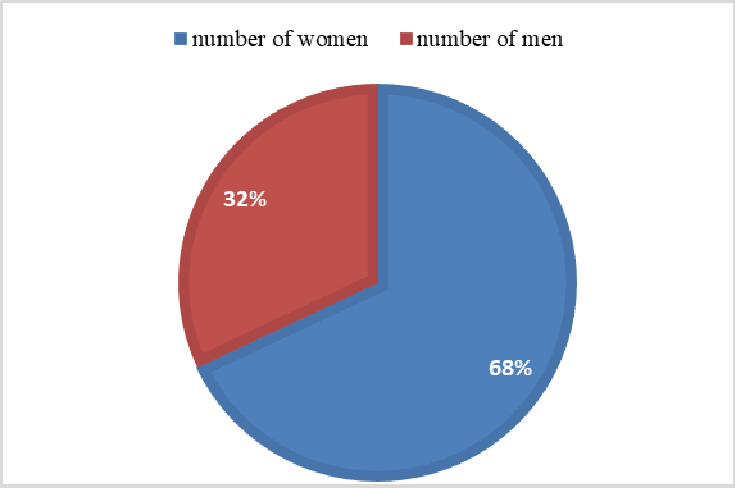

Figure 2 : Classification of the target population according to the sex

Use of aromatic and medicinal plants according to the age: The age extremes of the women in the population studied vary between 20 and over 60 years old, the majority of them (15 or 44.12 %) belonged to the age group (> 60 years), whereas there are no women belonged to the age group (< 20 years).

The age extremes of the men in the population studied vary between 30 and over 60 years, the majority of them (56.25 %) belonged to the age group [40 - 50] years, whereas there are no men belonged to the age group (< 20 years) or the age group [20 - 30] (Figure 3).

These results confirm that the elderly are more familiar with traditional herbal medicine than other age groups. Similarly, the low interest in the therapeutic effects of plants among people in other age groups under 40 years old is explained by the mistrust of young people in particular, who tend not to believe much in this traditional medicine (Mehdioui and Kahouadji, 2007).

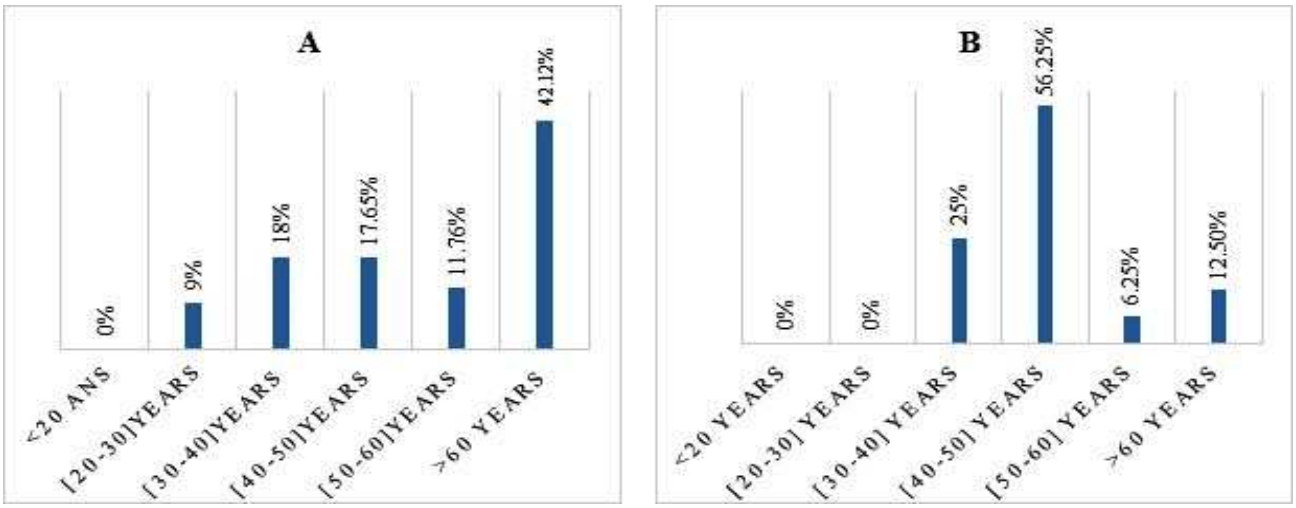

Figure 3: Classification of the women (A) and men (B) according to the age group

Use of aromatic and medicinal plants according to the education level: Concerning the education level, 50% of the women in the population were not educated, the remaining 50 % were divided between primary schooling (18 %), college secondary schooling (8.82%), qualifying secondary schooling (8.82%), and only 14.71 % of the women had higher education levels.

Concerning the educational level of the men in the population, 18.75 % were not educated, the remaining 81.25 % were divided between primary schooling (12.5 %), college secondary schooling (25%), schooling qualifying secondary (0 %), and 43.75 % of men had higher education levels.

According to the results obtained from interviews with herbalists and therapists in the region, it is the elderly women who have more knowledge of phytotherapy based on aromatic and medicinal plants (Figure 4).

These results are similar to those reported by (Tlemcani *et al*., 2023; Ammor *et al*., 2020; Barkaoui *et al*., 2017).

Medicinal plants can be dangerous when used unconsciously, and this is confirmed by illiterate people who cannot understand precisely the verbal instructions given by herbalists and healers. Therefore, they do not respect the dose, the part used and the way of preparation of medicinal plants, which manifests itself in harmful effects on the health of the user himself and on the preservation of biodiversity.

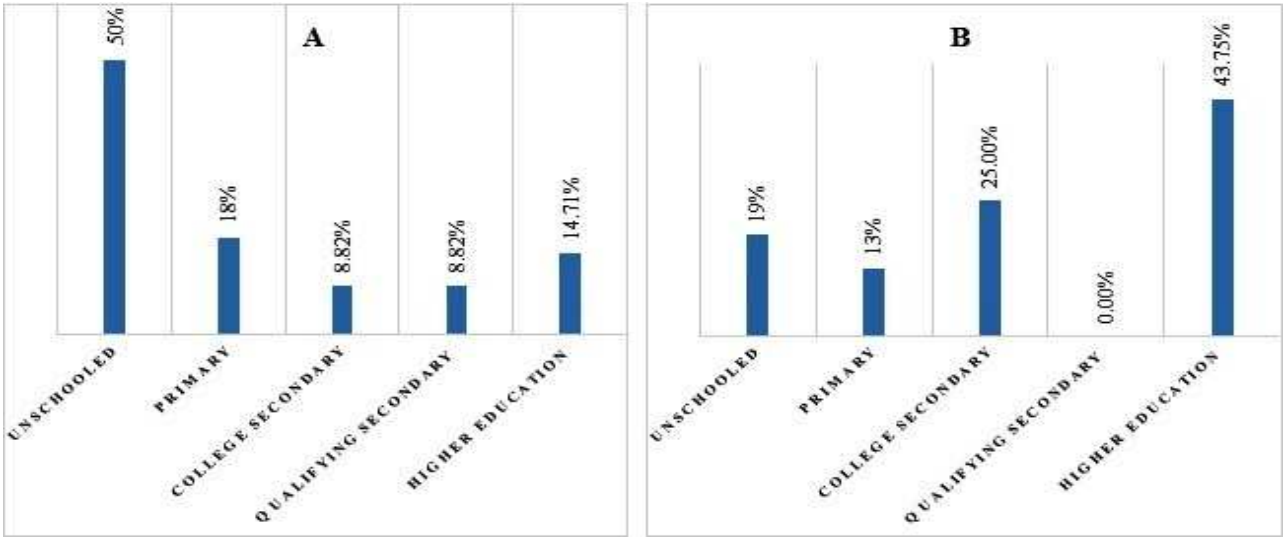

Figure 4 : Distribution of women (A) and men (B) in studier area (Midelt) according to the education level

Distribution of medicinal and aromatic plants: In the study area, 66 spontaneous and/or cultivated plant species divided into 30 plant families have therapeutic uses (Table 1).

The plant families that are well represented in the study area are Lamiaceae (10 species), Asteraceae (6 species) and Fabaceae (6 species). Five species were recorded from the Apiaceae family and also for the Rosaceae family, three species were recorded for the Cupressaceae and Murtaceae families, each of the remaining 23 families are represented by one or two AMP species.

The predominance of the Lamiaceae and Asteraceae families is identical to ethnobotanical studies conducted in North African areas like Morocco (Khabbach *et al*., 2012; Benlamdini *et al*., 2014; El Alami *et al*., 2016; Bouiamrine *et al*., 2017; Idm'hand *et al*., 2020; El Yaagoubi *et al*., 2023), Algeria (Sarri *et al*., 2014) or Libya (El-Darier and El-Mogaspi, 2009).

Commonly treated diseases and notable plants: According to the results obtained from interviews with herbalists and therapists in the region, older women have more knowledge of herbal medicine based on aromatic and medicinal plants. The list of therapeutic uses of MAPs is detailed in Table 1.

The population of Midelt uses aromatic and medicinal plants to traditionally treat several diseases and symptoms. However, the most mentioned diseases are gastrointestinal diseases with a rate of 25.42%, followed by respiratory diseases (13.13%), genito-urinary disorders (11.11%), fever (9.93%), headaches and migraine (7.74%), rheumatism and against cooling (6.40%), skin and hair disorders (5.05%), and other diseases with a rate of 4%. (Table 2)

Benlamdini *et al*., 2014, found that the medicinal plants listed in the Eastern High Atlas (Haute Moulouya) are more used in the treatment of digestive disorders, El hilaly *et al*., 2003, also reported that the most used plants in the region of Taounate - Morocco are recommended to treat gastrointestinal disorders, El Alami *et al*.,2016, al also reported that the medicinal plants most used by the population of northern Atlas of Azilal (Morocco) are recommended to treat gastrointestinal disorders, El Finou *et al*., 2023 also noted that the most commonly used plants in the Fez-Meknes region are recommended for treating digestive disorders, moreover, several other studies conducted in the Mediterranean region have confirmed our results in Algeria (Boudjelal *et al*., 2013; Ouelbani *et al*., 2013), in Spain (Benítez *et al*., 2010).

Used plants parts: The analysis of the results obtained showed that leaves are the most used part with a percentage of 25.68%, followed by grains and leafy stems with a percentage of 18.92%, followed by fruits (10.81%), then the flowers (5.41%) and the same for the use of the whole plant, roots (4.05%) of the same percentage for the bark, bulb (2.70%), the rest of the parts used is represented by a total percentage of 4.05% (Table 1).

These results are consistent with those reported by (Benlamdini *et al*., 2014; Ouhaddou *et al*., 2014; Benarba *et al*., 2016; Eddouks *et al*., 2017; Idm'hand *et al*., 2020; Tlemcani *et al*., 2023; El Finou *et al*., 2023; Ikraoun *et al*., 2023), where the grains and leaves were the parts most usually used in the treatment of different diseases.

Modes of preparation and administration: Several modes of preparation were recorded used, namely decoction or cooking which is the most used mode of preparation in the study area with a percentage of (46.17%), followed by powder (25.27%), maceration (16.49%), fumigation (3.3%) as well as for direct use in dishes (3.3%), cataplasm (2.2%) and also for infusion (2.2%) and their direct eating (1.1%) (Table1).

These results are similar to those of various authors in Burkina Faso (Nadembega *et al*., 2011), Tarfaya province in Morocco (Idm'hand *et al*., 2020), Fez- Meknes region of Morocco (Tlemcani *et al*., 2023), and other regions of Morocco (Belhaj *et al*., 2020; El Hachlafi *et al*., 2020; El-Assri *et al*., 2021).

The population uses several modes of administration, we could report essentially the administration by oral way (58, 95 %). In fact this way includes the majority of the modes of preparation: decoction, powder, and maceration. Then comes the local application (23.16%) used mainly in the treatment of skin diseases and hair care and diseases of the genital tract, followed by external use (9.47%) and inhalation pathway (4.21%). Other modes of administration (nasal, ophthalmic, foot bath ...) represented a percentage of 4.21% (Table 1).

The superiority of oral administration is well advised in several ethnobotanical studies carried out in Morocco at different regions (Abouri *et al*., 2012; Idm'hand *et al*., 2020), and other studies in Neighboring countries such as Algeria (Hadjadj *et al*., 2015; Sarri *et al*., 2017).

Table 1 : Medical virtues and important indexes of medicinal plants used in Midelt region (Morocco).

Family	Vernacular name (English, Arabic, Amazigh)	Scientific name	Origin (cultivated or spontaneous)	Traditional therapeutic uses	Part used	Method of preparation	Method of administration	UV	FL
Amaryllidaceae	Cultivated Garlic /Toûma / Tiskert	*Allium sativum*	Cultivated	Anti-dandruff -Gastric ulcer -Antipyretic- Against visual diseases	Bulb	Boiled in oil Mixing in oil	Oral way Eye drops	0.04	100
	Onion / Lbesla / Azalim	*Allium cepa L.*	Cultivated	Antipyretic	Bulb	Maceration Mix with anserine plant	Oral way / External use	0.4	100
Apiaceae	Green Anise / Habbet Hlawa	*Pimpinella anisum L.*	Cultivated	intestinal gas asthma	Grains	Powder with hot water	Oral way	0.02	100
	Ammodaucus / Kamoun Soufi	*Ammodaucus leucotrichus*	Cultivated	Stomachic Intestinal gas	Fruits and grains	Boiled in water	Oral way	0.08	75
	Common Cumin / Kamoun	*Cuminum cyminum L.*	Cultivated	Stomachic Intestinal gas	Grains	Decoction Powder with water	Oral way	0.04	100
	Wild Fennel / Basbas – Nafaâ	*Foeniculum vulgare Mill.*	Spontaneous	Intestinal gas Against the cooling Heart disease	Grains	Decoction Powder with water	Oral way	0.1	80
	Garvi / Karwya	*Carum carvi* L.	Spontaneous	Stomachic Digestive cramps	Grains	Cooked Maceration	Oral way	0.06	66.66
Apocynaceae	Pink Laurel / Defla – Alili	*Nerium oleander L.*	Spontaneous	Antidiabetic	leaves	Infusion	Inhalation Foot bath	0.02	100
Asteraceae	Absinthe / Chiba	*Artemisia absinthium L.*	Cultivated	Against cysts of the genital apparatus menstrual pain	leaves and stems	Cooked With hot water	Oral way	0.04	100
	White wormwood / Chih – Izri	*Artemisia herba alba Asso*	Spontaneous	Intestinal fungi Abdominal pain Diseases of the genital tract Wounds and eczema	leaves and stems	Cooked With hot water Powder in oil	Oral way External use Local application	0.26	76.92
	Chamomile / Babounj	*Matricaria camomilla*	Spontaneous	Hypotensive stomachic Constipation	leaves and flowers	Cooked Powder in the Henna plant	Oral way Local application	0.06	66.66
	Inule Visqueuse / Trhla – Magraman	*Inula viscosa (L.)*	Spontaneous	Against cooling Antipyretic Antiseptic	leaves and stems	Maceration with lemon or orange	Oral way Local application	0.14	57.14

	Laitue Scariol Scariol lettuce / Tuga Nsem – Hedba Lbldia	*Lactuca serriola L.*	Spontaneous	Food poisoning Insect and snake toxins Abdominal pain	leaves	juiceCooked Cooked Maceration Cataplasm	Oral way Local application	0.08	100
	Doum Palm / Doum	*Hyphaene thebaica (L.) Mart.*	Spontaneous	Headaches	Roots	Cooked	Oral way	0.02	100
Brassiaceae	Anastatica / Kaff Maryam	*Anastatica hierochuntica L.*	Spontaneous	Painful periods Stress Allergy Acne	Whole plant	Cooked Maceration Powder	Oral way Local application	0.04	50
	Gresson Alénois/ Hab Rechad	*Lepidium sativum L.*	Spontaneous	Gastric ulcer Abdominal pain	Grains	Cooked	Oral way	0.04	50
Bryophytes	Bryophytes / Sanbel	*Bryophyta schimp.*	Spontaneous	Inflammation of the digestive system	Whole plant	Cooked	Oral way	0.04	50
Caryophyllaceae	Herniaire Glabre/ Herras Lhjar	*Herniaria glabra L.*	Spontaneous	Infections and kidney diseases	leaves	Decoction with lemon	Oral way	0.06	66.66
	Anserina / Mkhinza	*Dysphania ambrosioides*	Spontaneous / Cultivated	Antipyretic Headaches Abdominal pain	leaves and stems	Cooked Maceration with lemon Maceration with onion	Oral way External use	0.6	100
Chenopodiaceae	Chou-Fleur De Bou Hamama / /Aknoud / El-Knoud Karnabit /	*Fredolia aretioides*	Spontaneous	Food poisoning	leaves and stems	Powder Cooked	Oral way	0.04	50
	Oxycedrus juniper / Takka	*Juniperus oxycedrus L.*	Spontaneous	Fever Wounds	stems / Whole plant	Sap by distillation	External use	0.04	100
Cupressacea	Red Juniper / Ârar	*Juniperus phoenicea L.*	Spontaneous	Gastric ulcer Abdominal pain Constipation Antipyretic	stems and leaves	Powder mix with water or milk	Local application	0.24	58.33
	Tiger Nut/ Tara	*Cyperus rotundus L.*	Spontaneous	Osteoarticular diseases inflamations of the genital tract	Grains	Powder with hot water	External use	0.04	50
	Carob tree / Kharoub	*Ceratonia siliqua L.*	Spontaneous / Cultivated	gastric ulcer	Fruits and grains	Eat directly	Oral way	0.04	50
Fabaceae	Holm oak / Tassaft	*Quercus ilex L.*	Spontaneous	Anemia Antiseptic	Bark	Powder mixed with Rubia plant and pomegranate	Oral way Local application	0.04	100

	Fenugreek / Halba	*Trigonella foenum-graecum L.*	Cultivated / Spontaneous	gastric ulcer	Grains	Powder with water In dishes	Oral way	0.06	100
	Alfalfa / Fassa	*Medicago sativa L.*	Cultivated	inflamation of the genital tract Against the cold	leaves and stems	Maceration Cataplasme	Oral way Local application	0.04	100
	Retama / Rtem – alggou	*Retama Raf.*	Spontaneous	Goiters Diabetes	Fruits and grains	Maceration	Oral way External use	0.04	50
Juclandaceae	walnut /Gergae – Douj	*Juglans regia L.*	Cultivated	inflamation of the Genicive	Bark and root	Maceration	Local application	0.02	100
	Musk Ivette / Chandgoura – Tuf Tlba	*Ajuga iva (L.)Schreb*	Spontaneous	Cough, Food poisoning	Whole plant	Cooked Maceration with lemon or water	Oral way	0.06	66.66
	Lavender / Khzama	*Lavandula angustifolia*	Spontaneous / Cultivated	stomach pain Menstrual pain and genital infection Abdominal pain Influenza Against the cold	leaves and flowers	Cooked Infusion	Oral way Local application External use Inhalation	0.16	62.5
	marjoram / Marddouch	*Origanum marjorana*	Cultivated / Spontaneous	Against cooling	stems and leaves	Cooked	Oral way	0.04	100
Lamiaceae	White Marrube / Mrriwa / Mirrou	*Marrubium vulgare L.*	Spontaneous	Cancers Headaches and migraines Dental pain Nasal congestion Rheumatism	leaves and stems	Cooked Maceration with oil	Oral way Local application Nasal drops	0.06	66.66
	Round-leaf mint / Marsita - Timrsad	*Mentha rotundifolia aucta*	Spontaneous	Abdominal pain	leaves and stems	Cooked	Oral way	0.16	87.5
	Pouliot Mint / Fliou	*Mentha pulegium L.*	Spontaneous	Cough Influenza	leaves and stems	In hot milk	Oral way	0.26	92.31
	Oregano / Zâtar	*Origanum vulgare L.*	Spontaneous	Abdominal pain headaches stomach pain food poisoning	Leaves	Cooked Decoction With hot water	Oral way	0.42	95.24
	Rosemary / Azir – Yazir	*Rosmarinus officinalis L.*	Spontaneous	Genital Infections Painful periods	stems and	Cooked Fumigation Powder with henna	Oral way External use	0.28	92.86

				Abdominal pain Coughing	leaves		inhalation Local application		
	Salvia / Salmia	*Salvia officinalis L.*	Cultivated / Spontaneous	Against foot eczema and cold Hypotensive Painful periods	leaves	Cooked	Oral way	0.04	100
	Common Thyme / Zîtra – Uzikennu	*Thymus vulgaris L.*	Spontaneous	Constipation	Leaves	Cooked Maceration	Oral way	0.1	60
Lauraceae	Cinnamon / Karefa	*Cinnamomum zeylanicum*	Cultivated	pain during childbirth and menstruation	Bark	Powder with water	Oral way	0.02	100
	Noble Laurel /Warkat Sidna Moussa	*Laurus nobilis L.*	Spontaneous	Genitourinary diseases	leaves	Powder in dish	Oral way	0.02	100
Linaceae	Cultivated Linum / Zerîat Lktan	*Linum usitatissim*	Cultivated	Osteoarticular diseases	Grains	Powder in dish	Oral way	0.02	100
Lythraceae	pomegranate / Rumman	*Punica granatum L.*	Cultivated	Gastric ulcer Anemia	Fruit peel	Decoction Powder Cooked	Oral way	0.04	100
	Henna / Henna	*Lawsonia inermis L.*	Cultivated	Against eczema	leaves	Powder	Local application	0.02	100
	Eucalyptus / Kaliptus	*Eucalyptus globulus labile*	Spontaneous	Against influenza and fever	stems and leaves	Fumigation Decoction Cataplasm	Inhalation Local application	0.16	85.71
Myrtaceae	Clove / Nwar – Qronfel	*Syzygium aromaticum (L.)*	Spontaneous / Cultivated	Dental pain Coughing	Grains and fruits	Powder Powder with lemon juice	Local application Oral way	0.04	100
	Myrtle / Rihan	*Myrtus communis*	Spontaneous / Cultivated	Genital and urinary tract infections Diabetes	leaves	Cooked	Local application External use Oral way	0.04	50
Nitrariaceae	Harmel	*Peganum harmala L.*	Spontaneous	Inflammation of the sciatic nerve Vertigo	Grains	Fumigation Mixing with oil	Inhalation Local application	0.06	66.66
Oleaceae	Oleaster / Zitoune	*Olea europaea L.*	Cultivated	Antidiabetic Hypotensive Dental pain	Leaves	Cooked With the Harmel	Oral way Local application	0.1	80
Papaveraceae	Poppies / Bellamane	*Papaver rhoeas L.*	Spontanée	Measles	leaves and flowers	Decoction Cooked	Oral way	0.04	100
Parmeliaceae	Usnea Beard / Lhyet Chikh	*Usnea barbata*	Spontaneous	Flavouring of dishes Against cooling	Stems and leaves	In dishes	Oral way	0.04	50

Plantaginaceae	Plantain / Lmessasa	*Plantago major(L.)*	Spontaneous	Acne	Leaves	Powder	Local application	0.02	100
Poaceae	Corn / Ddra	*Zea mays L.*	Cultivated	ConstipationDiuretic	Stigmas	Cooked	Oral way	0.04	50
	Common millet / Ilane	*Panicum miliaceum*	Cultivated	Osteoarticular diseases	Grains	Powder with milk or honey	Oral way	0.02	100
Ranunculaceae	Black Cumin / Sanuj	*Nigella sativa L.*	Cultivated	Heart disease	Grains	In dishes	Oral way	0.06	66.66
Rhamnaceae	Wild Jujube / Sdra – Nbaq	*Ziziphus Mill.*	Spontaneous	Renal infections	leaves and fruits	Powder Cooked	Oral way Local application	0.02	100
Rosaceae	Apricot / Machmach	*Prunus armeniaca L.*	Cultivated	Heart diseases	Leaves	In dishes	Oral way	0.04	50
	Hawthorn / Tabgha	*Crataegus laciniata ucriae*	Spontaneous	stomach pain	leaves	Decoction	Oral way	0.04	50
	Cherry tree / Hab Lmlouk	*Prunus cerasus L.*	Cultivated	heart diseases	fruit peduncles and grains	Cooked	Oral way	0.02	100
	Gognassier / Sferjel	*Cydonia oblonga Mill.*	Cultivated	Diarrhea Gastric ulcer	leaves	Cooked	Oral way	0.04	100
	Rosebush / Lward Lbeldi	*Rosa centifolia L.*	Cultivated / Spontaneous	Constipation Headaches Eye infection	Flowers	Cooked Powder Distillation	Oral way Local application	0.06	100
Rubiaceae	Madder /Taroubia – Lfwa	*Rubia tinctorum L.*	Spontaneous	Anemia, Gastric ulcer, liver cirrhosis	Roots	Powder with water or in dish or with pomegranate bark	Oral way	0.1	80
Rutaceae	Lemon tree / El- Hamed	*Citrus limon (L) burm.F.*	Cultivated	Respiratory diseases	Fruits	Juice mixed with honey or with Anserina	Oral way	0.6	100
Salicaceae	Salix / willow / Afsas	*Salix alba. L*	Spontaneous	Abdominal pain	leaves	With hot water	Oral way	0.02	100
Verbenaceae	Verbena / Lwiza	*Verbena officinalis L.*	Spontaneous / Cultivated	Against insomnia, Abdominal pain, Hypotensive, Gastric ulcer	Leaves	Cooked	Oral way	0.06	100
Zingiberaceae	Ginger / Skenjbir	*Zingiber officinalis*	Cultivated	Painful periods	Rhizome	Powder	Oral way Local application	0.02	100

Table 2: Informant consensus factor.

Category	Number of used reports (Nur)	% of used reports	Number of Taxa (Nt)	ICF
Allergy	22	3.70	4	0.875
Anemia	7	1.17	3	0.667
Antiseptic	6	1.01	2	0.8
Cancers	2	0.34	1	1
Cardiovascular diseases	9	1.52	4	0.625
Diabetes	9	1.52	4	0.625
Eye infection	5	0.84	2	0.75
Fever	59	9.93	7	0.897
Gastrointestinal pain	151	25.42	30	0.807
Genital diseases and pain of childbirth	66	11.11	13	0.815
Goiters	2	0.34	1	1
Headaches and migraines	46	7.74	5	0.911
Hypertension	12	2.02	4	0.727
Inflammation of the sciatic nerve	2	0.34	1	1
Insect and snake toxins	4	0.67	1	1
Insomnia	3	0.51	1	1
liver cirrhosis	2	0.34	1	1
Measles	2	0.34	1	1
Oral diseases	8	1.35	3	0.714
Osteoarticular diseases	9	1.52	3	0.75
Respiratory affections	78	13.13	9	0.896
Rheumatism and against cooling	38	6.40	8	0.811
Skin and hair disorders	30	5.05	6	0.828
Stress	2	0.34	1	1
Urinary diseases	9	1.52	5	0.5
Vertigo	3	0.51	1	1
Wounds	8	1.35	2	0.857

Use value (UV): The analysis of the results of this study shows that *Dysphania ambrosioides* and *Citrus limon* (L.) buri. F are the species most used by the population with a use value (0.6) for each, the second species recording a higher UV (0.42) is *Origanium vulgare L.*, followed by *Rosmarinus officinalis* L. with UV= 0.28, followed by the two species *Mentha pulegium* L. and *Artemisia herba alba Asso* with a UV= 0.26, then *Juniperus phoenicea L.* with UV= 0.24, *Eucalyptus globulus labile* , *Lavandula angustifolia* and *Mentha roundifolia aucta* have a UV= 0.16, the other species are less used by the population (UV inferior to 0.14) (Table1).

These results can be explained by the coldest climate of the region, which makes the population frequently use the mentioned species to treat diseases of the respiratory tract as well as rheumatism diseases and cold in general.

Fidelity level (FL): The fidelity level (FL) indicates the species that are favored in the treatment of a specific disease by informants in the study area, with the highest FL indicating that the species cited is most used by the informant (Table 1).

The plants with the highest fidelity levels (FL=100%) are *Allium sativum, Alium cepa L., Pinpinella anisum L., Cuminum cyminum L., Nerium oleander l., Artemesia absinthium L., Lactuca serriola L., Hyphaene thebaica (L.)Mart, Dysphania ambrosioides, Juniperus oxycedrus L., Trigonella foenum- graecum L., Medicago sativa L., Juglans regia L., Origanum marjorana, Salvia officinalis L., Cinnamomun zeylanicum, Laurus nobilis L., Limum usitatissim, Punica granatum L., Lawsonia inermis L., Syzygium aromaticum (L.), Papaver rhoeas L., Plantago major (L.), Panicum miliaceum, Ziziphus Mill., Prunus cerasus L., Cydonia oblonga Mill., Rosa centifolia L., Citrus limon (L.) buri. F, Verbina officinalis L., Zingiber officinalis* and *others.* Followed by *Origanum vulgare* L. (FL= 95.24%), then

Rosmarinus officinalis L. (FL= 92.86), *Mentha pulegium L.* (FL= 92.31%), *Mentha rotundifolia Aucta* (FL=87.5%), *Eucalyptus globulus labile* (FL= 85.71%), the other species have a FL < 80%.

Almost the same results were obtained during an ethnobotanical survey in the Eastern High Atlas (High Moulouya) (Benlamdini *et al*., 2014).

Conclusion: Traditional phytotherapy is still practised by people in the Midelt region of Morocco, despite the revolution in medical technology. The results of ethnobotanical surveys have shown that traditional knowledge of phytotherapy is held mainly by elderly women, the majority of whom are illiterate. A total 66 plant species belonging to 30 botanical families used in traditional medicine have been identified, with the leaves being the most widely used parts. Treatments are mainly prepared by decoction and administered exclusively orally.

In addition, the distribution of the frequency of use of medicinal plants according to the group of diseases treated showed that gastrointestinal infections are the main therapeutic indications with a percentage of 25.42%.

Finally, these data can be considered as a source of information for scientific research and can be used in the fields of phytochemistry and pharmacology.

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