ORIGINAL ARTICLE

# Inventory of medicinal plants prescribed by traditional healers in El Jadida city and suburbs (Morocco)

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**Background:** Traditional medicine is still popular in Morocco since it is an important form of health care of many people. **Aims:** The present ethnobotanical survey aims to make an inventory of plants and their medicinal uses by the population of El Jadida city and suburbs (Morocco). **Settings and Design:** Given the nature of the project, it was decided that a qualitative approach would provide the most effective tool for data collection. For that a semi-structured interview was used with a set of pre-determined questions. **Materials and Methods:** The study was conducted from October 2010 to April 2011. Forty-five interviews were conducted, each one involving more than one visit and sometimes with the participation of more than one informant. **Statistical Analysis:** All values are expressed in percentage. **Results:** A total of 102 species are inventoried belonging to 88 genera and 42 families of which 3 dominate: *Apiaceae* (13.7%), *Lamiaceae* (10.8%) and *Asteraceae* (8.8%). The most remedies are administered orally (88.2%) and prepared with an aqueous base, preferentially as decoction (42.2%), infusion (36.3%) or maceration (4.9%). The inventoried medicinal plants are widely used in indigenous pharmacopoeia to alleviate 22 pathological groups. **Conclusion:** Our results inventoried a wide range of medicinal plants used to treat various common human ailments. It appears necessary to preserve this medicinal knowledge and traditional system of health care by proper documentation and identification of specimens.

**Key words:** El Jadida city, ethnobotanical study, medicinal plants, traditional healers

## INTRODUCTION

There are about 500,000 species of plants on Earth, of which a wide range have medicinal properties. Despite the advances achieved by modern pharmacology and medicine, 80% of the worldwide population benefits from the contributions of traditional medicine in terms of health care, especially in developing countries, in the absence of a modern medical system.[1] Therefore, traditional knowledge of medicinal plants and their use by population are not only useful for conservation of traditional knowledge and biodiversity but also for primary health care and drug development.

The Moroccan variety of climate, geography and soil composition provides an interesting source of biodiversity of vegetation. The vascular flora of Morocco comprises about 5,200 indigenous and naturalised taxa distributed into 981 genera and 155 families.[2,3] Besides, the originality of the Moroccan flora is illustrated by its high percentage of endemism (20%).[4] This phyto-diversity allows Moroccan population in general and traditional healers in particular to have a long traditional knowledge on herbal medicine use.[5,6]

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Unfortunately, little is known about some Moroccan plant groups of high ecological, cultural and socioeconomic interest. Nevertheless, efforts are undertaken in order to remedy these hiatuses, and this survey aims to inventory medicinal plants knowledge of traditional healers in El Jadida city and suburbs (Western Morocco), which is a part of an initiative to document baseline data for future pharmacological and phyto-chemical studies.

## MATERIALS AND METHODS

### Studied Area

The survey was carried out in three districts (urban district of El Jadida city and rural districts of Moulay Abdallah and Haouzia) of El Jadida province, which is located in the western central plain of Morocco. The province is bounded by the Atlantic Ocean in the west and northwest, Province of Settat in the East and Province of Sidi Bennour in the South [Figure 1]. The studied zone has a surface of 3,060 km² and a population of 150,000. The climate is semi-continental to Mediterranean, humid in winter and semi-arid in summer. Rainfall ranges from 300 to 400 mm/year and temperature oscillates between

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**Received:** 21-04-2014; **Accepted:** 30-04-2014

8°C (December-January) to 28°C (July-August). The altitude of the region lies between 0 m and 100 m with a relief characterised by wide plains. The region is one of the most important agricultural centres of Morocco.

By its geographic and climatic contexts, the province of El Jadida offers a large ecological and floristic diversity. Therefore, the traditional medicine plays an important role in primary health care of the inhabitant of El Jadida province, notably in its suburb and rural areas. Due to the knowledge of traditional practitioners, a great variety of medicinal plants is used to treat various common ailments and disorders. Frequently, traditional practices are combined with modern medicine treatments.

### Data Collection

Ethnobotanical survey was carried out in the studied area from October 2010 to April 2011. Data collection was gathered through direct interview using a pre-established survey form, with inputs related to i) demographic information of the traditional healers interviewed (identity, age, gender, address, seniority in the profession, education level) and ii) ethnobotanical data, mainly focused on common local name, mode of preparation, parts of plant used, methods of preparation and administration, procurement method, place of collection and habitats, threats and conservation status, date/season of collection and types of treated diseases. Information was gathered from 45 traditional healers located in the study area: 15 weekly market healers and 30 herbalists (locally named Achab). Some interviews involved more than one visit and sometimes with the participation of more than one informant. Information was accepted as valid only if medicinal plant and its therapeutic use (s) was/were cited by at least four independent interviewees.

The ethnobotanical data obtained were checked and compared with the existing literature in the field.[7-11] A voucher specimens were referenced and deposited at the herbarium of our laboratory.

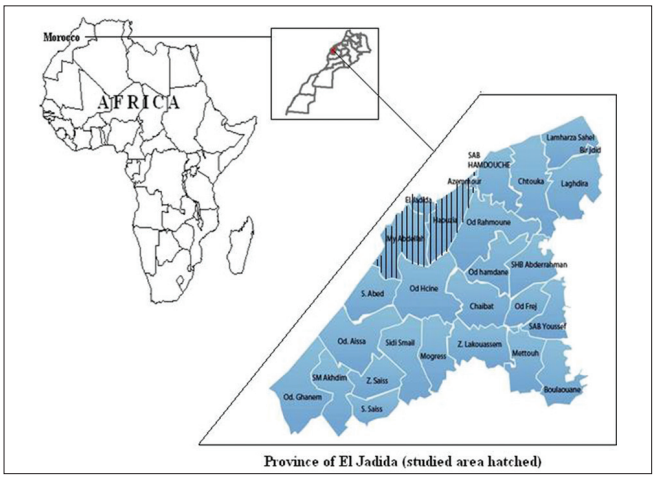


**Figure 1:** Map of the study area showing location of Morocco in Africa and Province of El Jadida in Morocco

## RESULTS

### Interviewees

Traditionally, the medicinal plants are men-based practices. However, our study reveals that women also perform it. The gender ratio men: Women is 80:20%, respectively. Ten percent of shop herbalists are women but this proportion increases to reach 40% among weekly market healers [Figure 2]. All shop herbalists interviewed consider their job as full-time profession while itinerant healers (weekly markets) consider their labour as a seasonal occupation to ameliorate their incomes. Regarding to the level of education, our results showed that 50% of the respondents are illiterate, 30% have primary education and 20% secondary education. The respondents have an average age of 55.5 ± 15.6 years and exert this profession since more than 20 years. All stated that they have acquired the medicinal plants knowledge from their parents and elderly relatives.

### Medicinal Flora

Information on medicinal, arranged alphabetically by genus and species names, is reported in Table 1. For each plant, information includes botanical and vernacular name, family, therapeutic use (s), part (s) of plant used and method (s) of preparation.

One hundred and two species, belonging to 88 genera and 42 families, were inventoried. Among the families identified, three dominate: *Apiaceae* (13.7%), *Lamiaceae* (10.8%) and *Asteraceae* (8.8%). The other inventoried families (39) are represented only by one to five species [Figure 3].

Except for two species (*Cassia senna* and *Ferula assa-foetida*), all the medicinal plants inventoried in this study are collected from different natural habitats of Morocco. Sixty-one percent of medicinal plants are wild species and 39% are cultivated species. Regarding to the growth form, our study showed that 65.7% of medicinal plants

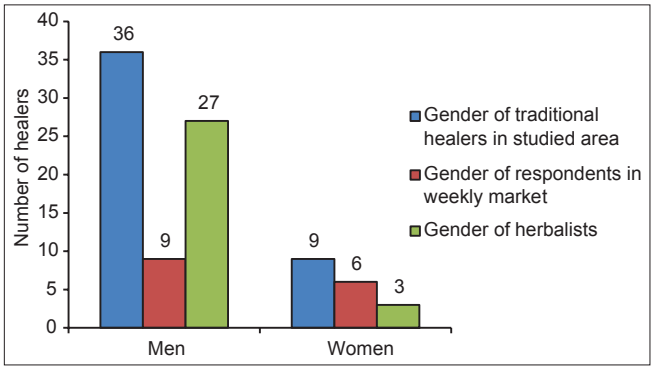


**Figure 2:** Distribution of traditional healers by gender

**Table 1: Vascular plant species used in folk medicine in El Jadida city and suburbs (Morocco)**

| Botanical name | Vernacular name | Family | Ailment alleged to cure | Part of plant used | Mode of preparation |
|---|---|---|---|---|---|
| *Ajuga iva (L.) Schreb* | Changoura | Lamiaceae | Choleretic, Fever, Healing, Stomachic, Tonic, Wounds | Leaf, flower | Infusion |
| *Allium cepa L.* | Bassal | Liliaceae | Abscesses, Cough, Diuretic, Fever | Bulb | Food or decoctio |
| *Allium sativum L.* | Touma | Liliaceae | Cough, Diabetes, Hypertension, Ringworm, Wormer, Wounds | Bulb | Food or decoction |
| *Ammi visnaga (L.)* | Bechnikha | Apiaceae | Diabetes, Renal pain, Tonic | Umbel, fruit | Decoction |
| *Apium graveolens L.* | Krafes | Apiaceae | Abdominal colics, Aphrodisiac, Diuretic | Root, fruit. | Decoctions of fruits and/or of powder of roots |
| *Aristolochia baetica L.* and *Aristolochia longa L* | Berztem | Aristolochiaceae | Abdominal infection, Constipation | Root | Food |
| *Artemisia arborescens L.* and *Artemisia absinthium L.* | Chiba | Asteraceae | Appetite stimulant, Choleretic, Diuretic, Emmenagog, Headache, Tonic, Wormer, Wounds | Branch | Decoction |
| *Artemisia herba-alba Asso.* | Chih | Asteraceae | Antispasmodic, Stomachic, Wormer | Leaf | Decoction |
| *Atractylis gummifera L.* | Addad | Asteraceae | Bleeding, Eczema, Toothache | Root | Decoction |
| *Brassica rapa L.* | Left beldi | Brassicaceae | Anaemia | Seed | Infusion |
| *Bryona dioica. Jacq.* | Aineb dib | Cucurbitaceae | Abdominal colics, Depurative, Diuretic, Scabies, Wormer | Root, berry | Decoction |
| *Calendula officinalis L.* | Jamra | Asteraceae | Anti-inflammatory, Anti-spasmodic Depurative, Healing | Flower | Infusion |
| *Camellia thea* Link. | Atay | Camelliaceae | Haemorrhoids | Leaf | Cataplasm |
| *Capparis spinosa L.* | Kabâr | Capparidaceae | Abscesses, Diuretic, Cold, Headache, Hypertension, Rheumatism, Tonic | Seed | Decoction |
| *Capsella bursa pastoris (L.) Medik* | Kiss arraii | Brassicaceae | Diarrhoea, Tonic | Whole plant | Infusion |
| *Capsicum frutescens L.* | Soudanya | Solanaceae | Burr of scalp, Hair care | Leaf | Cataplasm |
| *Carum carvi L.* | Carwiya beldya | Apiaceae | Abdominal colics, Anti-spasmodic, Aphrodisiac, Cold, Diabetes, Diuretic, Emmenagog, Flatulence, Stomachic | Fruit | Infusion |
| *Cassia senna L.* | Sanaa mekka | Ceasalpiniaceae | Diarrhoea, Wormer | Leaf, fruit | Infusions of leaves and/or of powder of fruits |
| *Ceratonia siliqua L.* | Kharroub | Ceasalpiniaceae | Diarrhoea, Gastric acidity, Emetic | Fruit | Infusion |
| *Chenopodium ambrosoides L.* | Mkhinza | Chenopodiaceae | Abdominal infection, Asthma, Cold, Fever, Flatulence, Headache, Menstrual pain, Wormer | Whole plant | Infusion |
| *Citrullus colocynthis (L.) Schrad.* | Hadja | Cucurbitaceae | Diabetes, Diuretic, Rheumatism, Snake bite | Fruit, root | Maceration of fruits; decoction of roots |
| *Clematis flammula L.* | Yasmin berri | Ranunculaceae | Rheumatism | Leaf | Cataplasm |
| *Conium maculatum L.* | Sakran | Apiaceae | Abortive | Leaf | Cataplasm |
| *Coriandrum sativum L.* | Kasbour | Apiaceae | Abdominal colics, Aphrodisiac, Bladder ailment, Flatulence, Rheumatism, Sedative, Sleep disorder, Stomachic | Fruit | Decoction |
| *Corrigiola telephiifolia Pour.* | Sarghina, tasarghint | Caryophyllaceae | Diuretic, Tonic, Wounds | Root | Decoction |
| *Crocus sativus L.* | Zaafrane | Iridaceae | Diuretic, Gastric acidity, Improve breath, Tonic | Flower | Infusion |

*Contd...*

**Table 1: Contd...**

| Botanical name | Vernacular name | Family | Ailment alleged to cure | Part of plant used | Mode of preparation |
|---|---|---|---|---|---|
| *Cucurbita pepo L.* | Graâ hamra | Cucurbitaceae | Ringworm, Wormer | Seed | Decoction |
| *Cupressus sempervirens L.* | Sarw | Cupressaceae | Bleeding, Cough, Diarrhoea, Healing | Resin, cone. | Decoction |
| *Cynara humilis L.* | Timta | Asteraceae | Burns | Root | Decoction |
| *Cynodon dactylon (L) Pers* | Njem | Poaceae | Abdominal colics, Bladder ailment, Cough, Depurative, Emollient | Root | Infusion |
| *Cynoglossum officinale L.* | Houricha | Borraginaceae | Diuretic | Leaf | Decoction |
| *Daphne gnidium L* | Metnan | Thymelaeaceae | Hair care | Leaf | Cataplasm |
| *Delphinium staphysagria L.* | Habbat Ras | Ranunculaceae | Hair care | Seed | Cataplasm |
| *Echinops spinosus L.* | Tasskra | Asteraceae | Appetite stimulant, Cold, Diabetes, Renal stones | Root | Decoction |
| *Elaeoselinum asclepium (L.)* Bertol. | Arq yabu | Apiaceae | Headache | Root | Cataplasm |
| *Eryngium triquetrum* Vahl | Mrhizla | Apiaceae | Depurative, Diuretic, Laxative | Root | Decoction |
| *Eucalyptus camaldulensis Dehn.*and *Eucalyptus gomphocephala A de C.* | Calyptous | Myrtaceae | Bladder ailment, Pulmonary infection | Leaf | Infusion |
| *Ferula assa-foetida L.* | Haltit | Apiaceae | Antispasmodic, Fever, Flatulence, Wormer | Resin | Cataplasm |
| *Foeniculum vulgare P. Mil. I* | Nafaâ | Apiaceae | Abdominal colics, Anti-spasmodic, Bladder ailment, Cough, Flatulence, Promote Lactation, Renal pain, Stomachic, Tonic | Seed | Infusion |
| *Fumaria officinalis L.* and *Fumaria capreolata L.* | Hachichate Sabyan | Fumariaceae | Choleretic, Depurative, Tonic | Whole plant | Infusion |
| *Globularia alypum L.* | Ain larnab | Globulariaceae | Appetite stimulant, Bladder ailment, Burns, Diabetes, Healing, Skin buttons, Tuberculosis, Wounds | Leaf | Decoction |
| *Glycyrrhiza glabra L.* and *Glycyrrhiza foetida Desf.* | Aârk souss | Papilionaceae | Abdominal colics, Anti-spasmodic, Appetite stimulant, Cold, Constipation, Cough, Flatulence, Tonic, Dental care | Root | Decoction |
| *Helianthus annuus L.* | Nouar shams | Asteraceae | Improve breath | Petals of flower | Maceration |
| *Hippomarathrum libanotis L.* | Kolikha | Apiaceae | Headache, Rheumatism | Essential oils extracted from root | Cataplasm |
| *Laurus nobilis L.* | Assa moussa | Lauraceae | Appetite stimulant, Asthma, Asthenia, Flatulence, Gingivitis, Rheumatism, Stomachic | Leaf | Infusion |
| *Lavandula multifida L.* | Khzama | Lamiaceae | Abdominal colics, Anti-spasmodic, Bladder ailment, Diabetes, Wounds | Leaf, flower | Infusion of leaves; maceration of flowers in olive oil |
| *Lawsonia inermis L.* | henné | Lythraceae | Hair care | Leaf | Cataplasm |
| *Lepidium sativum L.* | Hab rchad | Brassicaceae | Asthma, Cough, Promote Lactation, Tonic | Seed | Decoction |
| *Linum usitatissimum L* | Zeriat lkettan | Linaceae | Anti-inflammatory, Depurative, Wormer | Seed | Infusion |
| *Lippia citriodora H. B et K* | Lwiza | Verbenaceae | Sedative, Stomachic | Leaf | Infusion |
| *Lupinus albus L.* | Termass | Papilionaceae | Diabetes, Sedative, Stomachic | Seed | Decoction |
| *Malva sylvestris L.* | Bakkoula, khbiza | Malvaceae | Abdominal colics, Cold, Constipation, Cough, Depurative, Healing | Leaf, flower | Decoction |
| *Mandragora autumnalis Bertol.* | Baid Ighoul | Solanaceae | Healing, Rheumatism | Root | Infusion |

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**Table 1: Contd...**

| Botanical name | Vernacular name | Family | Ailment alleged to cure | Part of plant used | Mode of preparation |
|---|---|---|---|---|---|
| *Marrubium vulgare L.* | Marriwt | Lamiaceae | Abdominal colics, Abscesses, Cold, Cough, Diabetes, Fever, Sedative, Wounds | Whole plant | Infusion |
| *Mentha pulegium L.* | Fliyou | Lamiaceae | Asthma, Cold, Cough | Leaf | Infusion |
| *Mentha viridis L.* | Naânaâ | Lamiaceae | Aphrodisiac, Cold, Flatulence, Headache, Tonic, Toothache | Whole plant | Infusion |
| *Myristica fragrans* Houtt | Gouza | Myristicaceae | Aphrodisiac | Fruit | Decoction |
| *Myrtus communis L.* | Rihane | Myrtaceae | Cough, Sedative, Wounds | Leaf | Decoction |
| *Nerium oleanderL.* | Defla | Apocynaceae | Cold, Headache, Toothache, Wounds | Root, leaf | Decoction of roots; maceration of leaves |
| *Nigella sativa L.* | Sanouj, habba sawdaa | Ranunculaceae | Abdominal colics, Anaemia, Anti-spasmodic, Aphrodisiac, Asthma, Cold, Cough, Headache, Promote Lactation, Pulmonary infection, Rheumatism, Tonic, Wormer | Seed | Decoction |
| *Ocimum basilicum L.* | Lahbak | Lamiaceae | Antispasmodic, Sedative | Whole plant | Infusion |
| *Olea europea var. oleaster* | Zitoun | Oleaceae | Diabetes, Diuretic, Hypertension | Leaf | Infusion |
| *Origanum majorana L.* | Mardedouch | Lamiaceae | Sedative, Stomachic | Whole plant | Infusion |
| *Origanum compactum Benth.* | Za'atar | Lamiaceae | Abdominal colics, Flatulence, Stomachic | Leaf | Decoction |
| *Papaver rhoeas L.* | Bellaaman | Papaveraceae | Asthma, Cold, Cough, Improve breath, Sedative, Skin buttons, Tonic | Flower | Infusion |
| *Peganum harmala L.* | Harmel | Zygophyllaceae | Abdominal colics, Abortive, Anti-spasmodic, Cold, Diarrhoea, Eczema, Haemorrhoids, Jaundice, Rheumatism, Women sterility, Wounds | Seed | Decoction |
| *Pennisetum typhoides (Burm). Stapf and Hubb* | Illan | Poaceae | Anaemia, Diabetes, Hypocholesterolemic | Seed | Decoction |
| *Petroselinum sativum. Hoffm* | Maâdnous | Apiaceae | Diuretic, Emmenagog, Insect bite, Stomachic, Tonic | Whole plant, fruit | Juice of whole plant; decoction of fruits; rub of leaves |
| *Pimpinella anisum L.* | Habbat Hlawa | Apiaceae | Antispasmodic, Aphrodisiac, Asthma, Diuretic, Flatulence, Stomachic | Root | Infusion |
| *Pinus halepensis Mill.* | Sanawbar | Pinaceae | Astringent, Cough, Diarrhoea, Eczema, Ringworm, Wounds | Cone, resin | Decoction |
| *Pistacia atlantica Desf.* | Betoum | Anacardiaceae | Abdominal colics | Leaf, Bark | Decoction |
| *Pistacia lentiscus L.* | Mesqua harra, drou | Anacardiaceae | Abdominal colics, Dental care, Diabetes, Emmenagog, Tonic | Leaf, bark, resin | Decoction |
| *Punica granatum L.* | Ramman | Punicaceae | Abdominal colics, Diarrhoea, Ringworm, Stomachic, Wormer, Wounds | Bark | Infusion |
| *Ranunculus bullatus L.* | Wden Lhallouf | Ranunculaceae | Emetic | Root | Decoction |
| *Ricinus communis L.* | Kharwae | Euphorbiaceae | Headache | Leaf | Cataplasm |
| *Rhus pentaphylla Desf.* | Tizgha | Anacardiaceae | Abdominal colics, Diarrhoea | Leaf, root, bark | Infusion |
| *Rosa centifolia Mill.* | Werd | Rosaceae | Abdominal colics, Toothache | Flower | Decoction |
| *Rosmarinus officinalis L.* | Azir | Lamiaceae | Abdominal colics, Appetite stimulant, Cold, Choleretic, Emollient, Healing Hypocholesterolemic, Pulmonary infection, Renal pain | Leaf, flower | Infusion |
| *Rumex acetosa L.* | Hoummaida | Polygonaceae | Constipation, Jaundice | Root | Decoction |
| *Rubia peregrina L.* | Fouwa | Rubiaceae | Anaemia, Choleretic, Diuretic | Root | Infusion |

*Contd...*

**Table 1: Contd...**

| Botanical name | Vernacular name | Family | Ailment alleged to cure | Part of plant used | Mode of preparation |
|---|---|---|---|---|---|
| *Salvia officinalis L.* | Salmiya | Lamiaceae | Abdominal colics, Anti-perspirant, Anti-spasmodic, Cold, Cough, Diabetes, Emmenagog, Flatulence, Rheumatism, Stomachic, Tonic | Leaf | Infusion |
| *Salvia verbenaca (L) Briq* | Khyatta | Lamiaceae | Abdominal colics, Cold, Fever, Healing | Leaf | Cataplasm of leaves, decoction of powder of dried leaves |
| *Saponaria vaccaria L.* | Tighacht | Caryophyllaceae | Depurative, Eczema, Tonic | Root | Decoction |
| *Silybum marianum L.* | Chouk Jmel | Asteraceae | Typhoid | Leaf, root | Decoction |
| *Sinapis alba L.* and *Sinapis nigra (L) W. Dkach* | Kherdel | Brassicaceae | Cold, Headache, Stomachic, Wormer | Seed, leaf | Decoction |
| *Solanum nigrum L.* | Aïneb Dib | Solanaceae | Headache, Sedative | Leaf, berry | Cataplasm |
| *Solanum sodomeum L.* | Lim Nsara | Solanaceae | Women sterility | Fruit | Infusion |
| *Tetraclinis articulata Mast.* | Araâr | Cupressaceae | Abdominal colics, Anti-dizziness, Cold, Diarrhoea, Diuretic, Emetic, Fever, Headache | Leaf, cone | Maceration |
| *Thapsia garganica L. and Thapsia villosa L.* | Deryas | Apiaceae | Antispasmodic, Cough, Rheumatism, Women sterility | Root | Infusion |
| *ThymeLea lythroides (Barr. and Murb)* | Matnane | Thymelaeaceae | Abdominal colics | Bark, leaf | Infusion |
| *Trigonella foenum graecum L.* | Halba | Papilionaceae | Anaemia, Appetite stimulant, Asthma, Cough, Diabetes, Fever, Promote Lactation, Stomachic, Tonic | Seed | Decoction |
| *Urginea maritima (L.) Baker* | Aânsla | Liliaceae | Abscesses, Anaemia, Cold, Jaundice | Bulb | Infusion |
| *Urtica dioica L.* | Horriga | Urticaceae | Diuretic, Tonic | Leaf | Infusion |
| *Verbascum sinuatum L.* | Meslah | Scrofulariaceae | Pimples treatment, Rheumatism, Snake bite | Root, leaf | Infusions of leaves and/or of powder of grilled roots |
| *Zygophyllum gaetulum Emb.* and *Maire* | Aggaya | Zygophyllaceae | Abdominal colics, Choleretic, Diabetes | Leaf | Decoction |

are herbs, followed by shrubs (18.6%), trees (9.8%) and sub-shrubs (5.9%).

## Therapeutic Use

The inventoried medicinal plants are used by the population of study area in their routine practices to treat a wide range of common ailments and disorders. Sixty-six different ailments were inventoried and classified into 22 pathological groups of diseases [Table 2]. Among these pathological groups, four dominate and represent more than a half (56.2%) of the cited ailments: Gastrointestinal ailments (22.1%), broncho-pulmonary diseases (13.6%), uro-genital illnesses (12.0%), liver and metabolic disorders (8.5%). Regarding to the gastrointestinal ailments, the most symptoms cited by interviewees are abdominal colics (28.9%), stomachic (19.3%), flatulence (13.3%), diarrhoea (10.8%) and depurative (9.6%). For broncho-pulmonary diseases, cold (37.3%), cough (33.3%) and asthma (15.7%) are the most symptoms cited. Uro-genital illnesses are represented by diuretic (37.8%), aphrodisiac (15.6%), bladder (13.3%) and emmenagog (11.1%) indications, while diabetes (49.8%), anaemia (18.8%) and choleretic (18.8%) represent the most symptoms cited in liver and metabolic disorders.

## Preparation and Administration Modes

All the parts of medicinal plants are used, but with different use frequency [Figure 4]. Aerial parts are the parts mostly cited on the preparation of remedies (69.5%) followed by underground parts (23.5%) and whole plant (7.0%). Extracts from medicinal plants (resin and essential oils) are also used and come from five species (*Cupressus sempervirens, Ferula assa-foetida, Hippomarathrum libanotis, Pinus halepensis, Pistacia lentiscus*). Otherwise, 70% of remedies are prepared from a single plant part, whereas 30% require different plant parts. Regarding to the status of use (fresh/dry) of medicinal plants, it was found that 70% of medicinal plants are used in dry form, 20% in both forms and 10% in the fresh form (data not shown).

As shown in Figure 5, the most medicinal plants inventoried are administered preferentially through direct oral ingestion (88.2%), whereas external use, as cataplasm preferentially, represents only 12.7%. Plant preparations for oral administration are mainly water-based as decoction (boiling water with the plant for some minutes), infusion (scalding the plant) and/or maceration (83.3%). Other minor modes of oral ingestion comprise food, juice and rub (4.9%). The most remedies described by traditional

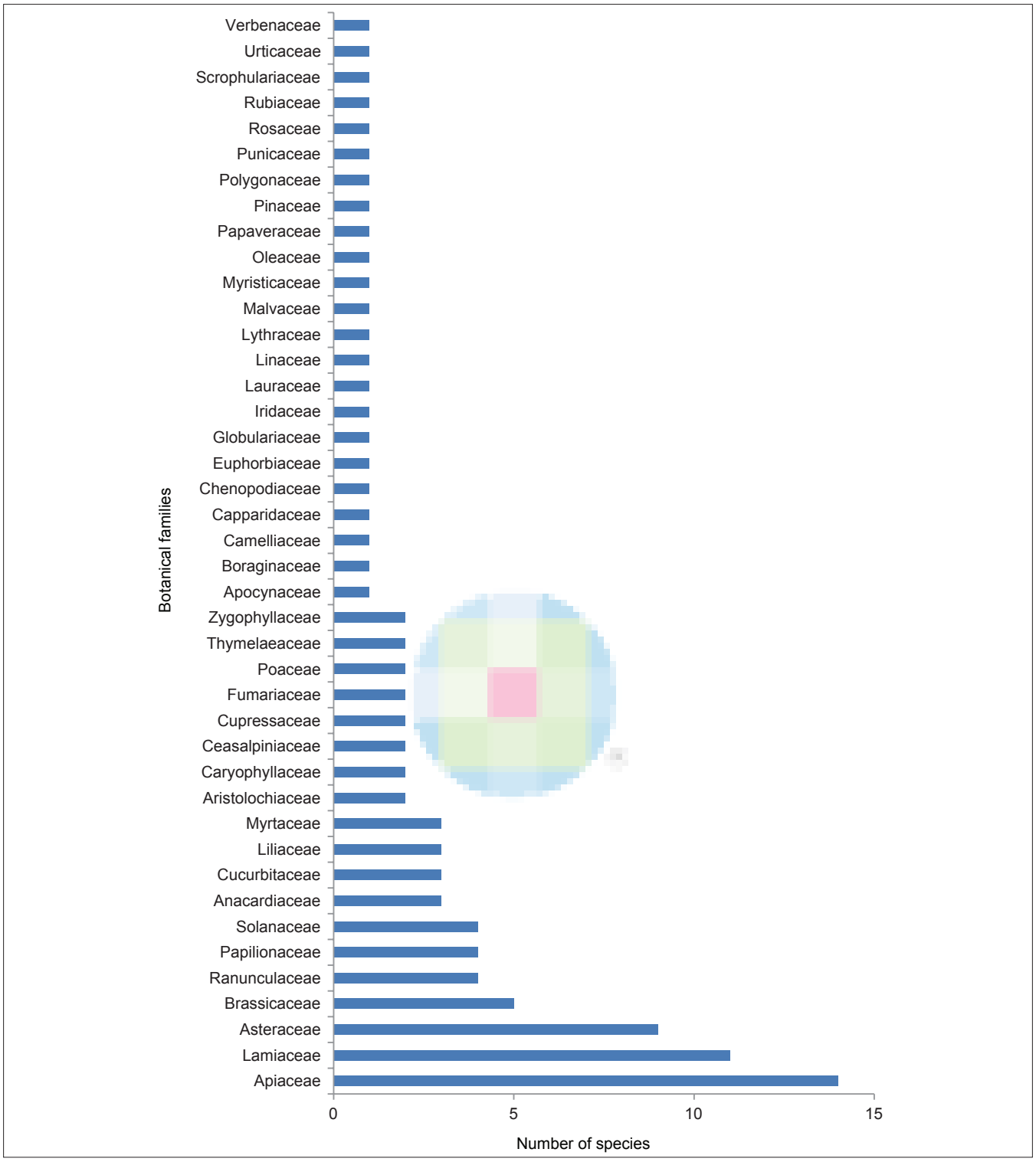


**Figure 3:** Distribution of species in different botanical families

healers required a single mode (93.1%); only a few medicinal plants can be prepared with different modes (6.9%).

## DISCUSSION

Ethnomedicine and traditional healers play an important role in primary health care in Morocco, especially in rural areas, where access to modern health care facilities is lacking.[12] The information obtained in this study was mainly gathered through semi-structured and direct interviews among the local traditional healers located in the study area. The choice of traditional healers is due to their significant role in primary health care system and their lore acquired from generation to generation since a very long time. However, we

**Table 2: Pathological groups of common ailments cited by traditional healers**

| Pathological groups (%) | Ailments cited by interviewees | Number of plants cited to cure |
|---|---|---|
| Gastrointestinal ailments (22.1) | Abdominal colics | 24 |
| | Stomachic | 16 |
| | Flatulence | 11 |
| | Diarrhoea | 9 |
| | Depurative | 8 |
| | Constipation | 4 |
| | Emetic | 3 |
| | Abdominal infection | 2 |
| | Haemorrhoids | 2 |
| | Gastric acidity | 2 |
| | Laxative | 1 |
| | Typhoid | 1 |
| Broncho-pulmonary disorders (13.6) | Cold | 19 |
| | Cough | 17 |
| | Asthma | 8 |
| | Improve breath | 3 |
| | Pulmonary infection | 3 |
| | Tuberculosis | 1 |
| Uro-genital disorders (12) | Diuretic | 17 |
| | Aphrodisiac | 7 |
| | Bladder ailment | 6 |
| | Emmenagog | 5 |
| | Renal pain | 3 |
| | Women sterility | 3 |
| | Abortive | 2 |
| | Menstrual pain | 1 |
| | Renal stones | 1 |
| Liver and metabolic disorders (8.5) | Diabetes | 15 |
| | Anaemia | 6 |
| | Choleretic | 6 |
| | Jaundice | 3 |
| | Hypocholesterolemic | 2 |
| Analgesic (5.6) | Headache | 12 |
| | Sedative | 9 |
| Tonic (5.6) | Tonic | 20 |
| | Asthenia | 1 |
| Antiseptic (5.3) | Wounds | 12 |
| | Healing | 8 |
| Skin diseases (4.5) | Abscesses | 4 |
| | Eczema | 4 |
| | Burns | 2 |
| | Emollient | 2 |
| | Skin buttons | 2 |
| | Burr of scalp | 1 |
| | Pimples treatment | 1 |
| | Scabies | 1 |
| Anti-inflammatory (3.7) | Rheumatism | 12 |
| | Anti-inflammatory | 2 |
| Antispasmodic (3.5) | Antispasmodic | 13 |
| Wormer (3.2) | Wormer | 12 |
| Febrifuge (2.1) | Fever | 8 |
| Appetite stimulant (1.9) | Appetite stimulant | 7 |
| Mouth care (1.9) | Toothache | 4 |
| | Dental care | 2 |
| | Gingivitis | 1 |
| Cardiovascular and circulatory system disorders (1.3) | Hypertension | 3 |
| | bleeding | 2 |
| Antifungal (1.0) | Ringworm | 4 |
| Hair care (1.0) | Hair care | 4 |
| Lactagogue (1.0) | Promote lactation | 4 |
| Anti-poison (0.8) | Snake bite | 2 |
| | Insect bite | 1 |
| Astringent (0.5) | Antiperspirant | 1 |
| | Astringent | 1 |
| Anti-dizziness (0.3) | Anti-dizziness | 1 |
| Insomnia (0.3) | Sleep disorder | 1 |
| Total: 22 | 66 | 375 |

have encountered various problems associated mainly with information collection, because some traditional healers did not wish to divulge easily their knowledge. Communication and explanation of the objectives of the survey were useful to overcome such obstacles.

Our results reveal the therapeutic potential applications of 102 taxa, which is quantitatively higher than some ethnobotanical studies achieved in other regions of Morocco.[13-20] Among botanical families, three dominate (*Apiaceae, Lamiaceae* and *Asteraceae*) representing the third of medicinal plants inventoried in the study area.

The prevalence of these families was also mentioned by various ethnobotanical studies achieved in other regions of Morocco. However, their frequency change according to the region and could be explained by the geomorphology and climate characteristics of the studied area.[14-16,18,19] The prevalence of these botanical groups was also noted in other Mediterranean countries.[21,22] The other inventoried families (39) are represented only by one to five species which demonstrates the biodiversity of medicinal plants used in folk medicine and represents a good indicator of the persistence of popular knowledge on herbal plants held by the traditional healers living in the studied area. The most inventoried medicinal plants are wild, but cultivated plants are also used, notably those having a good commercial value. Our results reveal that 60% of taxa come from other regions of Morocco, two species are endemic (*Corrigiola telephiifolia* and *Origanum compactum)* and two species are imported from the outside of Morocco (*Cassia senna* and *Ferula assa-foetida*). Similar results were obtained by ethnobotanical studies achieved in other regions of Morocco.[13-20]

The inventoried medicinal plants are used to treat a large spectrum of common ailments and disorders [Table 2].

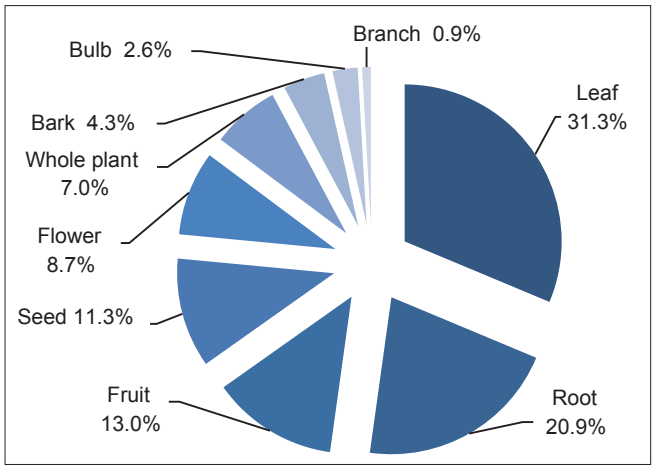


**Figure 4:** Use frequency of the medicinal plant parts

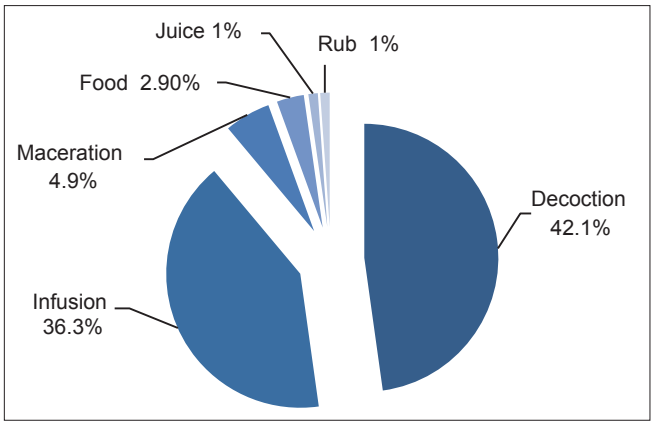


**Figure 5:** Distribution of the mode of oral administration

The remedies prescribed by traditional healers can be used for curative purpose, for examples: Against digestive pathologies, particularly colics, flatulence and diarrhoea; against broncho-pulmonary illnesses, among which cold, cough and asthma treatments predominate; against uro-genital diseases mainly as diuretic or to treat bladder infections; against liver and metabolic disorders notably anaemia, jaundice and hypercholesterolemia. The remedies can be also prescribed as prophylactic to prevent a wide range of disorders among which digestives troubles, asthenia, women sterility, menstrual pain, hair care, fever, lactagogue, anti-perspirant, anti-dizziness and insomnia can be mentioned. Gastrointestinal disorders are the most common treatments prescribed by traditional healers which is the case in various surveys carried out in other regions of Morocco[14,16] and Mediterranean countries.[21,22]

The preparations are drawn mostly from single plant, but mixtures of different plants are also cited (data not shown). Among the plant parts used, aerial parts are the main ingredient of herbal medicine preparations in study area (80 species), whereas underground parts concern 27 species and whole plant only 8 species. These results are corroborated by other studies in the field and could be explained by the easy access to aerial parts of the plant.[13-16,18,20] Some preparations required a single plant part while others needed a combination of different plant parts. The plant extract, like resin and essential oils, are reported only for four and one species, respectively. The most medicinal plants (84 taxa) are used to treat various disorders, reaching 13 different therapeutic indications as it is the case for *Nigella sativa*. Only 18 species are indicated for a single and specific treatment. A large part of remedies are taken orally mainly as decoction, infusion or maceration. These methods of preparation were also reported as the mode of choice to prepare remedies in other regions of Morocco[14,16,18] and Mediterranean countries.[21,23,24]

## CONCLUSION

Our results inventoried a wide range of medicinal plants used to treat a large spectrum of human illnesses. Many people from the study area are still depending on medicinal plants, at least for the treatment of some simple ailments and disorders. The importance of traditional medicine in primary health care system of Morocco imposes the necessity to acquire and preserve this traditional knowledge by proper documentation, identification of specimens and phyto-pharmacological studies.

## ACKNOWLEDGMENTS

We thank all traditional healers of the study area for their estimated contribution in sharing their accumulated indigenous knowledge.

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**How to cite this article:** ***

**Source of Support:** Grant from Ministry of higher education of Morocco,
**Conflict of Interest:** None declared.