Available online at www.derpharmachemica.com

ISSN 0975-413X
CODEN (USA): PCHHAX

Der Pharma Chemica, 2018, 10(5): 11-18
(http://www.derpharmachemica.com/archive.html)

Ethnobotanical Survey of Medicinal and Aromatic Plants Used by the People of Targuist in the North of Morocco

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ABSTRACT

An ethnobotanical survey of plants has been carried out in Targuist area (North of Morocco), it aimed to collect information on the medical and cosmetic uses of plants. By using 3500 questionnaires, ethnobotanical survey was conducted during two periods (2016 and 2017), with traditional herbalists and users of these plants. The analysis of results identified 90 plants distributed in 43 families with a dominance of the lamiaceae (15.28%). The survey revealed that leaves were the most used part of the plants (43%) and the majority preparation used was a decoction (36.6%). Digestive diseases represent the most cited diseases (31%).

Keywords: Medicinal and aromatic plants, Ethnobotanical survey, Questionnaire, Targuist

INTRODUCTION

Medicinal plants still remain a source of medical care in the developing countries in the absence of a modern medical system [1]. Morocco is one of the Mediterranean countries which have a long medical tradition and a traditional know-how to basis of medicinal plants [2,3]. By its geographical situation, the Kingdom is a natural framework quite original that offers a full range of Mediterranean bioclimate that fosters a rich and varied flora. In effect, the Moroccan flora contains about 500 species and subspecies, potentially aromatics and/or medicinal, including a very reduced number operating on an industrial scale [2]. The ethnobotanical studies that have been carried out in Morocco show that regional data on medicinal plants are very fragmented and scattered [4-9]. Our study is part of the objective: to establish a catalog of the medicinal plants used by the population of Targuist city, collect the therapeutic applications, and local traditional plants.

MATERIALS AND METHODS

Description of the study area

The City of Targuist derives its name from the Berber word "targist" which means "man standing." It is located in the Tangier-Tetouan-Al-Hoceima and Rif regions (Latitude: 34° 57' North; longitude: 4° 18' west; Altitude: 994 m). The province of Targuist is surrounded by the Mediterranean Sea to the north, the province of Taounate to the south, the province of Taza to the east and the province of Chefchaouen to the west (Figure 1). The total population of the province is estimated at 26,000 inhabitants with a high density of 2352.8 inhabitants/km².

Figure 1: Geographical situation of Targuist province

Method of the ethnobotanical study

The information on the use of medicinal plants are collected from the inhabitants of the city of Targuist during the year 2016-17. To meet the objectives of the study, a sheet questionnaire has been developed. It is based on open-ended and close-ended questions. The content of these fact sheets have been established in order to collect the maximum information on therapeutic uses of medicinal plants. This questionnaire contains two main parts: The first corresponding to the profile of the surveyed (Age, level of education, family situation) and the second devoted to plants (Vernacular names, pathologies treated, part used).

The taxonomic identification of the harvested species was later carried out in the laboratory of the Faculty of Science and Technology of Fez through a number of botanical works [5,10,11]. A total of 3,500 questionnaire sheets were developed; the data of the survey ethnobotanical obtained have been processed by the Excel software.

RESULTS AND DISCUSSION

Profile of respondents

In the province of Targuist, both sexes are affected by traditional herbal medicines. However, women have a greater knowledge on the plant species and their use with a predominance of 79% against a percentage of 21% among men (Figure 2a). Most of the respondents are older than 40 years (48%), then come the age 30-40, and less than 30 years with respective percentages of 37% and 15% (Figure 2b). At the level of the study area, the majority of the respondents are illiterate (42%), followed by the categories of primary and secondary with percentages respectively 39% and 19%. Nevertheless, people with a university level education use little medicinal plants with a percentage of 2% (Figure 2c).

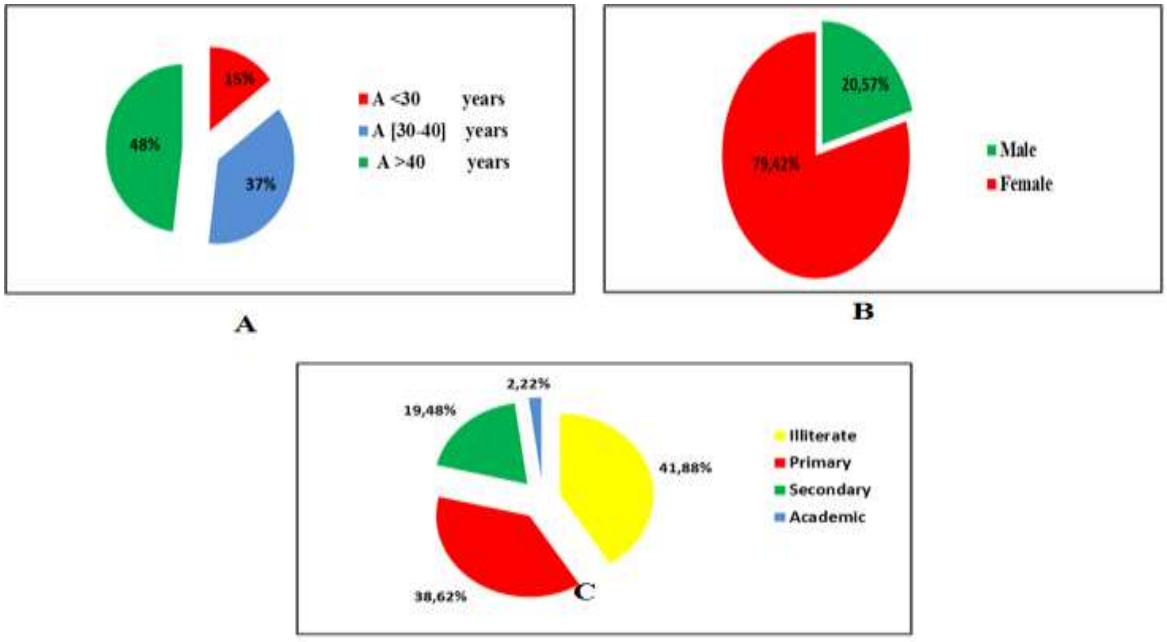

Figure 2: Distribution of the medicinal plants use frequency by sex (a), Distribution of the frequency of medicinal plants use by age group (b), Distribution of the frequency use of medicinal plants according to the educational level (c)

Parts of the plant used

In traditional medicine, different parts of plants identified particularly the leaves, flowers, seeds, roots, the fruit or even whole plant are exploited by the local population. In our study, the leaves are most used with a rate of 43.27%, followed by the seeds (21.94%), the roots (13.34%), the flowers (7.25%), the entire plant (6%) and the whole of the parts remaining used namely fruit, bark, bulbs, rhizomes and stems are represented by a cumulative rate of 8.13% (Figure 3).

This frequency of use raised of leaves, seeds and roots (78.55%) can be explained by the ease and the speed of the harvest [12-14]. But also by the fact that leaves are the seat of the photosynthesis and sometimes the storage of the secondary metabolites responsible for biological properties of the plant.

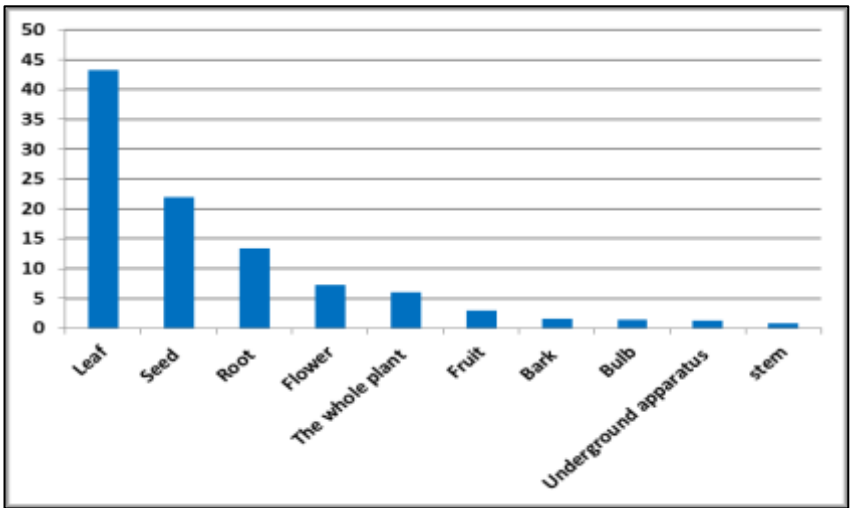

Figure 3: Distribution of the various parts medicinal plants used

Modes of preparation

In order to facilitate the administration of the active principles of the plant, several modes of preparation are employed to know the decoction, the infusion, the powder, fumigation, cataplasm, and the maceration. In the region of Targuist, the decoction remains the most dominant mode of preparation (36.4%), followed by the powder preparation and infusion respectively by 27.51% and 21.8%. The percentage of the other modes of preparation grouped (Cataplasm, maceration, cru) does not exceed 8% (Figure 4).

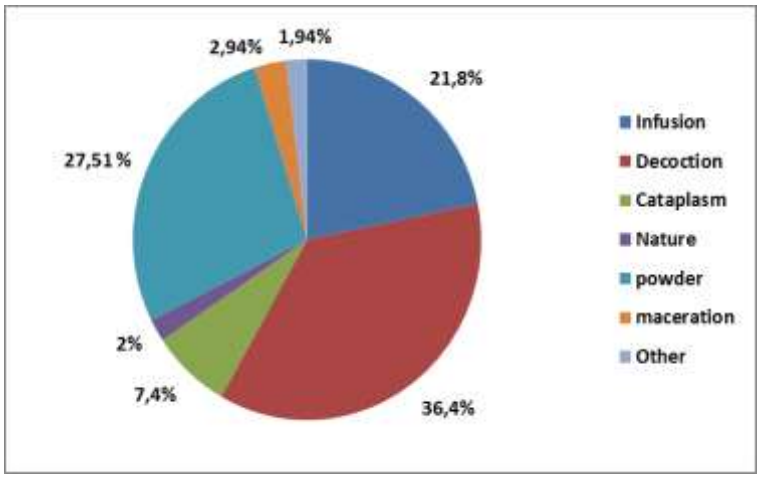

Figure 4: Distribution of different preparation methods of treatment plants

Mode of the administrations

According to Figure 5, most of the prepared recipes are orally prescribed with a large percentage of 65% followed by the ointment with a percentage of 25%, the rinsing and the massage with a 4% percentage, and the others mode of administration (2%) are little used by the local population.

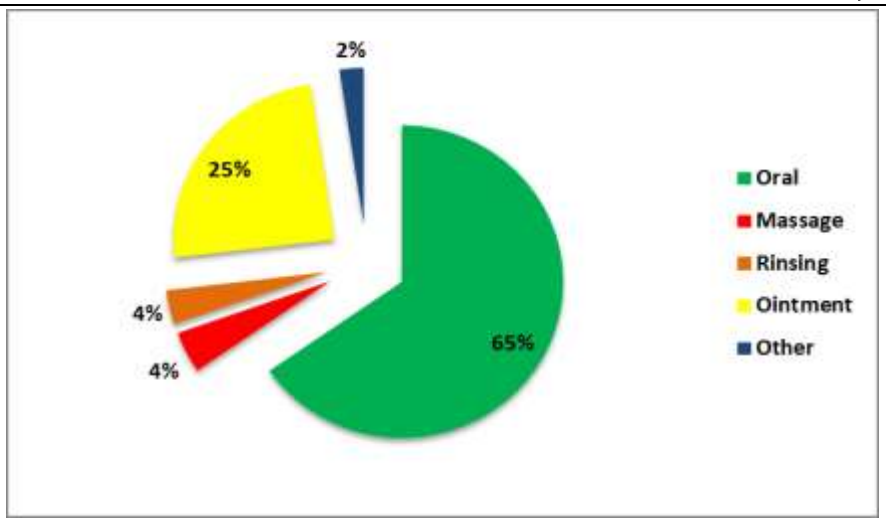

Figure 5: Distribution of the modes of administrations

Type of diseases treated

The ethnobotanical survey conducted in the Targuist region has identified a number of pathologies treated by medicinal plants. The results shown in Figure 6 show that the majority of medicinal plants are the main intervention in the treatment of diseases of the digestive system with a percentage of 31%, followed by dermatological diseases (29%), respiratory diseases (14%) and metabolic diseases (10%). These same results were found by Tahri et al. [15] in the province of Settat, by Salhi et al. [16] in the city of Kenitra and Daoudi et al. [17] in the province of Khénifra. The rest of the diseases (Genitourinary, glands annexes, neurological, ostéoarticular glands and cardiovascular) represent less than 6%, which suggests that the local population are not affected by these last disorders.

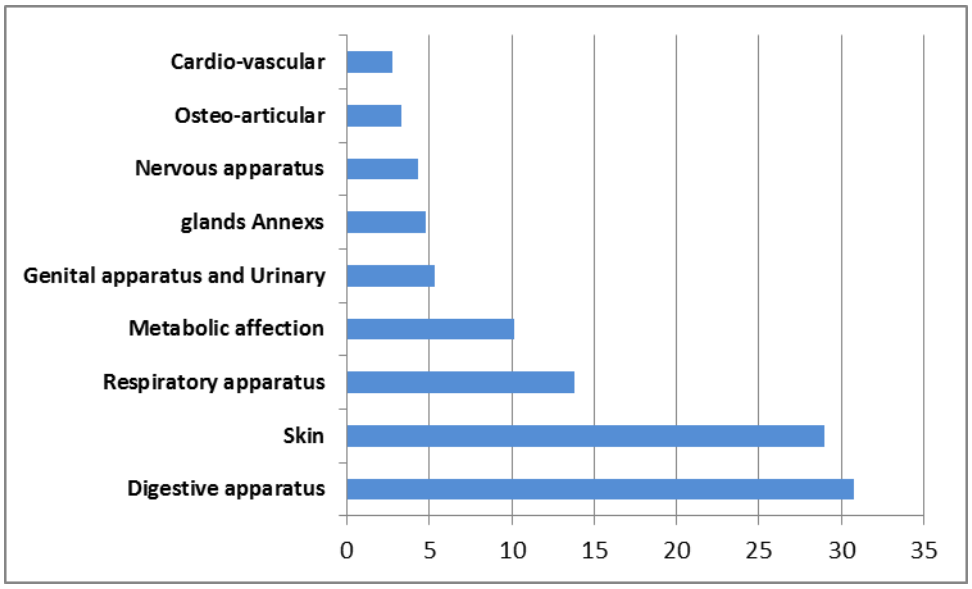

Figure 6: Distribution of the different uses of medicinal plants in the treatment of diseases

Floristic analysis

According to the families

The medicinal species identified in the study area are of 90 species distributed in 43 families. The analysis of these results (Figure 7) shows that the Lamiaceae family occupies the first ranks with a percentage 15.28%, Apiaceae (9.31%), Asteraceae (8%), Fabaceae (6.14%), Poaceae (6.12%), Myrtaceae (4.17%) and Liliaceae and anacardiaceae and caryophyllaceae with the same percentage (3%). The rest of families are represented by 47.28%. The result is in accordance with that obtained by Bouayyadi et al. [18] in the region of the west of Morocco and Benlamdini [19] in oriental High Atlas of Morocco.

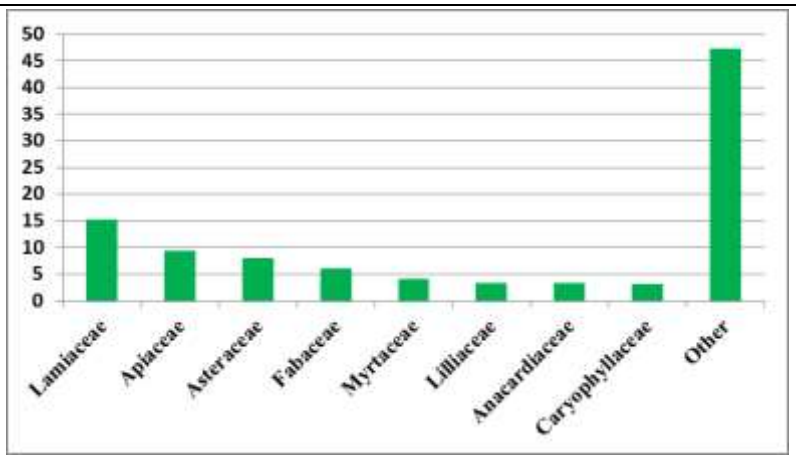

Figure 7: Frequency of families the most cited

According to the most used medicinal plants

On the totality of the results obtained, we gathered the most used species in traditional herbal medicine by the local population. Most of the species (Table 1) grow spontaneously or are grown in the study area.

Table 1: The first 20 medicinal species used the most in the region of Targuist

Family	Scientific name of the species	Vernacular name	Number of citation
Thymus	*Thymus vulgaris*	Zaatar	192
Lamiaceae	*Mentha pulegium*	Fluo	185
Cannabaceae	*Cannabis sativa*	Lkif	106
Lamiaceae	*Rosmarinus officinalis*	Azir	99
Asparagaceae	*Leopoldia comosa*	Zaz	90
Myrtaceae	*Eugenia caryophyllata*	Kranfal	81
Cupressaceae	*Juniperus foetidissima*	Laraar	76
Lamiaceae	*Ocimum basilium L,*	Rihane	69
Ranunculaceae	*Nigella sativa*	lhaba souda	69
Lamiaceae	*Salvia officinalis*	salmia (kasaine)	65
Fabaceae	*Trigonella foenum-graecum*	Helba	62
Poaceae	*Pennisetum glaucum*	ilane (dakhne)	61
Caryophyllaceae	*Herniaria hirsuta*	haras lahjar	61
Pinaceae	*Pinus halepensis Mill,*	Tayda	58
Anacardiaceae	*Pistacia lentiscus*	Drou	58
Amaranthaceae	*Chenopodium ambrosioides*	Mkhinza	56
Lamiaceae	*Lavandula stoechas*	Halhal	56
Anacardiaceae	*Pistacia atlantica*	Btem	56
Asteraceae	*Inula viscasa Ait,*	Bagarman	51
Asteraceae	*Atractylis gummifera L,*	Togham	50

CONCLUSION

The ethnobotanical study conducted in the province of Targuist made it possible to inventory the medicinal plants used in the specific traditional medicine of this region. Indeed, the results of this study shows that the local population still prefer to use natural species to address their daily ills. The Information acquired from the questionnaire forms helped us to compile a catalog of 90 plant species whose monographs of medicinal plants are represented in this article.

These taxa is distributed in 43 families with a clear dominance of the Lamiaceae family. In addition, the analysis of the results obtained show that the leaves are the most used part with a percentage of 43%. The decoction (36%) is the most popular method of preparation in most recipes and oral mode (65%). These medicinal plants are used mainly for the treatment of diseases of the digestive system (31%), dermatological diseases (29%), and respiratory diseases (14%). Finally, phytochemical, pharmacological and toxicological studies on these plants must be carried out for the purpose of scientific validation of the traditional uses of these plants and to make the traditional medicines Bios.

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SUPPLEMENTARY DATA

ANNEXE 1: Ethnobotanical survey sheet

Informant

- **Age:** A1 (< 30); A2 (30-40); A3 (> 40)
- **Sex:** Male & Female
- **Level of study:** Illiterate; Primary; Secondary; Academic
- **Family situation:** Married & Single

Vegetal material

Medicinal species	Type of disease	Preparation Mode	Used Part	Dose utilise	Sale price

Used Part: Stem; Flower; Fruit; Seed; Bark; Underground apparatus; Bulb; Leaf; The whole plant
Instructions of usage: Infusion; Decoction; Cataplasm; Nature; Powder; Maceration; Other.,
Administration mode: Oral; Massage; Rinsing; Ointment; Other,
Side effects: --------
Toxicity: ---------

ANNEXE 2

Supplementary Table: Aromatic and medicinal plants used in traditional medicine by the Targuist population

Family	Scientific name of the specie	Vernacular name	Number of citation	Part used	Preparation	administration	Medicinal use
Anacardiaceae	*Pistacia atlantica*	Btem	56	Leaves and Bark	Decoction	Oral	Against stomach pains
	Pistacia lentiscus	Drou	58	leaves and Bark	Decoction and Powder	Oral	Anti-diarrheal and diabetes
	Rhus pentaphylla	Tizgha	38	Leaves	Cataplasm	Ointment	Against injury
Asteraceae	*Artemisia herba-alba*	Chih	4	Leaves	Decoction	Oral	Intestinal worms, cold, stomach pains
	Artemisia absinthium	Chiba	4	Leaves	Infusion	Oral	Diabetes, stomach pains
	Scolymus hispanicus	Garnina	2	Roots	Decoction	Oral	Diabetes
	Lactuca sativa	Elkhasse	5	Leaves	Cataplasm	Oral	Headache
	Atractylis gummifera L,	Togham	50	Roots	Powder	Ointment and Oral	Inhibits bleeding and vomiting
	Inula viscosa Ait,	Bagarman	51	Leaves	Cataplasm	Ointment	Wound healing
	Bellis sylvestris	Hellala	49	Leaves	Infusion	Oral	Intestinal pains
	Calendula arvensis	Jamra	32	Flower	Cataplasm	Ointement	Anti-inflammatory and antiseptic
Apiaceae	*Cuminum cyminum L,*	Bouchnikha	26	Seeds	Decoction	Oral	Toothache
	Daucus carota	Khizou	3	Roots	Nature	Oral	Anti-diarrheal
	Carum carvi	karwiya	48	Seeds	Infusion	Oral	Facilitates digestion
	Petroselinum sativum	Maadnous	2	Roots	Powder	Ointment	Antirheumatismal
	Ammodaucus leucotrichus Coss.	Camoun soufi	37	Seeds	Powder and Infusion	Oral	Anti-diarrheal, Dermatological disease and osteoarticular
	Foeniculum vulgare	Nafaa	49	Seeds	Decoction	Oral	The painful rules
	Pinpinella anisum	Yansoune	47	Seeds	Infusion	Oral	Genitourinary diseases, anti-lice
	Conium maculatum L.	Ziyata	3	Leaves	Decoction	Oral	Female infertility
	Apium graveolens L,	krafass	18	Leaves	Decoction	Oral	kidney pain
	Petroselium crispum	Maadnous	14	Flower	Infusion	Oral	Neurological diseases
Lamiaceae	*Lavandula stoechas*	Halhal	56	Leaves	Decoction	Oral	Against the flu
	Lavandula	khzama	47	Flower	Decoction	Oral	Asthma

	angustifolia						
	Ocimum basilicum L,	Lahbaq	22	Leaves	Cataplasm	Ointment	Fever
	Lavandula multifida L,	Kohayla	32	Leaves	Powder	Oral	Lung disorders
	Mentha suaveolens	Marseta	12	Leaves	Decoction	Oral	Vertigo
	Mentha pulegium	Fluo	185	Leaves	Infusion	Oral	Respiratory disease
	Teucrium fruticans	Miou	24	Leaves	Decoction	Oral	Cold
	Salvia officinalis	Salmia	65	Leaves	Infusion	Oral	Digestive system diseases
	Origanum majorana	Mardadouche	19	Leaves	Essential oils	Oral	Respiratory disease
	Rosmarinus officinalis	Azir	99	Leaves	Infusion	Oral	Respiratory disease
	Ocimum basilium L,	Rihane	69	Leaves	Infusion	Oral	Digestive system diseases
Fabaceae	*Trigonella foenum-graecum*	Helba	62	Seeds	Powder	Oral	Against weight loss, stomach pain, osteoarticular
	Glycyrrhiza glabra L,	Arq sousse	12	Roots	Powder	Oral	Cough, stomach pain
	Vicia faba L,	Lfoul	3	Fruit	Powder	Oral	Gastric acidity
	Cicer arietinum L	Lhamss	11	Seeds	Powder	Oral	Renal lithiasis
	Ceratonia siliqua	Kharoub	16	Fruit	Powder	Oral	digestive system diseases
	Phaseolus vulgaris	loubya	26	Seeds	Powder	Ointment	Eczema
	Cassia fistula	Khyar chambar	12	Fruit	Powder	Oral	Joint pain
Lilliaceae	*Asphodelus microcarpus salzm*	Barwag	28	Roots	Cataplasm	Ointment	Dermatological disease
	Urginea maritima	Bassla dib	31	Roots	Decoction	Oral	Digestive system diseases
	Asparagus officinalis L,	Sakom	40	underground apparatus	Decoction	Oral	Diuretic
Poaceae	*Hordeum vulgare L,*	Chaair	4	Seeds	Powder	Oral	Antidiarrheal
	Zea mays	Dra	18	Seeds	Decoction	Oral	Anti-inflammatory, antidiabetes
	Pennisetum glaucum	Ilane (dakhne)	61	Seeds	Powder	Oral	Joint pain
Malvaceae	*Hibiscus sabdariffa*	Karkadi	47	Flower	Infusion	Oral	Respiratory disease, Hair strengthening
	Malva sylvestris	Khobbeza	3	Leaves	Cataplasm	Ointment	Anti-inflammatory
Myrtaceae	*Eucalyptus globulus*	Kalibtus	46	Leaves	Decoction	Oral	stomach pains and urinary affection
	Myrtus communis	Rayhan	29	Leaves	Powder	Oral and Ointment	Stomach pains, hair strengthening
	Eugenia caryophyllata	Kranfal	81	Flower	Powder	Massage	Joint pain
Ericaceae	*Arbutus unedo*	Bakhanou	7	Roots	Decoction	Oral	Digestive system diseases
Arecaceae	*Chamaerops humilis*	Doum	40	Fruit	Decoction	Oral	Anti-diarrheal
Iridaceae	*Crocus sativus*	Zaafrane lhor	11	Leaves	Powder	Ointment	Eczema
	Gladiolus italicus	Sif-dib	34	Roots	Infusion	Oral	Stomach pain
Caryophyllaceae	*Herniaria hirsuta*	Haras lahjar	61	Leaves	Powder	Oral	Genitourinary diseases
	Saponaria officinalis L,	Saponia	47	Leaves et Roots	Cataplasm	Ointment	Eczema
Cucurbitaceae	*Citrullus colocynthis L,*	Lahdaj	25	Seeds	Powder	Oral and Ointment	Relaxing the stomach, eczema
	Bryonia dioica	Ineb dib	38	Roots	Decoction	Oral	Anti-diarrheal
Thymelaeaceae	*Thymelaea hirsuta*	Matmane	50	Flower	Powder	Rinsing	Hair strengthening
	Daphne gnidium	Lazaz	38	Leaves	Powder	Rinsing	Hair strengthening
Ranunculaceae	*Ranunculus bulbosus*	Sanat lfar	15	Leaves	Powder	Ointment	Skin disease
	Nigella sativa	Lhaba souda	69	Seeds	Essential oils	Oral and Rinsing	Respiratory disease, hair strengthening
Zingiberaceae	*Elettaria cardamomum*	Lhil	42	Leaves	Maceration	Oral	Digestive system diseases, cold
Fagaceae	*Quercus rotundifolia*	Karouch	28	Roots	Decoction	Oral	Fever
	Quercus petraea	Balout	11	Flower	Cataplasm	Massage	Cardiovascular diseases
Apocynaceae	*Caralluma europaea cuss*	Daghmouss	46	Leaves	Decoction	Oral	Cough, asthma

Cactaceae	*Opuntia ficus-indica*	Dalahia (hendiya)	21	Leaves et Roots	Decoction	Oral	kidney stones, anti-inflammatory
Amaranthaceae	*Chenopodium ambrosioides*	Mkhinza	56	Leaves	Decoction	Oral	gastrointestinal diseases, fever
Polygonaceae	*Rumex acetosa*	Hommayda	4	Leaves	Decoction	Oral	Digestive system diseases
Punicaceae	*Punica granatum L,*	Romane	7	Fruit	Decoction	Oral	Digestive system diseases
Rhamnaceae	*Zyziphus lotus*	Nbeg	11	Fruit	Nature	Oral	Digestive system diseases
Rosaceae	*Prunus amygdalus*	Louz	5	Seeds	Cataplasm	Ointment	Hair strengthening
Capparaceae	*Capparis spinosa L,*	Kabbar	46	Seeds	Powder	Oral	Cough
Solanaceae	*Datura stramonium L,*	Chdak jmal	37	Leaves	Cataplasm	Ointment	Anti-inflammatory
Aristolochiaceae	*Aristolochia longa L,*	Berztam	32	Roots	Powder	Ointment	Skin disease
Gentianaceae	*Centaurium erythraea*	Gosset lhaya	45	Flower	Powder	Ointment	Wound healing
Convolvulaceae	*Convolvulus althaeoides L,*	Lawaya	29	Leaves	Infusion	Oral	Constipation
Boraginaceae	*Echium plantagineum L,*	Lawcham	27	Leaves	Decoction	Oral	Diuretic
Papaveraceae	*Papaver rhoeas L,*	Balaaman	42	Flower	Infusion	Oral	Cough
Pinaceae	*Pinus halepensis Mill,*	Tayda	58	Leaves	Cataplasm	Ointment	Toothache
Plantaginaceae	*Plantago coronopus L,*	Rjal laghrab	32	Leaves	Cataplasm	Ointment	Anti-inflammatory
Thymus	*Thymus vulgaris*	Zaatar	192	Leaves	Infusion	Oral	Digestive system diseases
Cannabaceae	*Cannabis sativa*	Lkif	106	Seeds	Powder	Rinsing	Hair strengthening
Euphorbiaceae	*Ricinus communis*	Lkharouaa	47	Seeds	Essential oils	Rinsing	Dermatological disease, hair strengthening
Lauraceae	*Laurus nobilis*	Rand	20	Leaves	Decoction	Oral	Digestive system diseases
Asparagaceae	*Leopoldia comosa*	Zaz	90	Leaves	Powder	Rinsing	Hair strengthening
Cupressaceae	*Juniperus foetidissima*	Laraar	76	Bulb	Powder	Oral	Metabolic diseases
Valerianaceae	*Valeriana officinalis*	Nardine	27	Leaves	Powder	Oral	Neurological diseases, hair strengthening
Brassicaceae	*Lepidum sativum*	Hab rchad	51	Seeds	Decoction	Oral	Respiratory disease
Paeoniaceae	*Paeonia officinalis*	Oud salib	46	Seeds	Essential oils	Oral	Neurological diseases