



Inventory of medicinal plants in the Site of Biological and Ecological Interest of Kharouba (Central Plateau, Morocco)

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Abstract

The Site of Biological and Ecological Interest (SBEI) of Kharouba remains undiscovered and less valorized despite its floristic diversity. Set in the Central Plateau region of Morocco, this site offers not only some nice *Tetraclinis* stands (*Tetraclinis articulata* (Vahl.) Masters), but also harbors one of the natural forests with an important floristic richness. This work aims to evaluate the floristic diversity and to elaborate a catalog of the medicinal plants of Kharouba SBEI. The methodology adopted is based on the inventory of all medicinal plants existing among a total of 145 floristic plants of the SBEI. The results of this study led us to identify 52 medicinal plants belonged to 49 genera and 33 families mainly: *Asteraceae*, *Apiaceae*, *Oleaceae* and *Anacardiaceae*. Among the identified species in this study zone 7 are abundant, 13 moderately abundant and 32 are rare to very rare.

Keywords: Medicinal Plants, Site of Biological and Ecological Interest, floristic diversity, Morocco

1. Introduction

Compared to other Mediterranean countries and due to its geographical position between the Atlantic Ocean to the West and the Mediterranean Sea to the North, Morocco has got orographic, lithological, edaphic, climatic and original bioclimatic diversities. All these elements together are the source of this country's floristic, faunistic and biocenotic richness [1]. In fact nearly 600 plant species are qualified as medicinal and aromatic plants in Morocco [2].

The Site of Biological and Ecological Interest (SBEI) of Kharouba, by its location in the central part of the Moroccan Central Plateau, offers some nice *Tetraclinis* stands (*Tetraclinis articulata* (Vahl.) Masters). It's still one of the most natural forests of the region, with an important floristic richness. However, this floristic diversity remains undiscovered and less valorized.

Even so, this site is under multiple pressures that threaten its floristic diversity. This area, besides being occupied by a local underprivileged population that depends on these forest resources, is often subjected to drastic climatic conditions. These factors, along with permanent overgrazing, anarchic cuts and the underrating of medicinal plants value, are the main causes of the intense exploitation of Kharouba forest resources.

In this context, the present work aims to drawing up the list of medicinal plants and to present the plants currently exploited or potentially exploitable in the SBEI of Kharouba for a better and monitored use.

2. Materials and methods

The study area was comprised between the latitudes 33° 30' 39.567"N and 33° 36' 19.969" N and the longitudes 5° 48' 19.314"E and 5° 55' 39.317"E. Kharouba SBEI (Figure 1) is a priority 1 site [3], with an area of 6300 ha. Located in the Central Plateau of Morocco, it is characterized by mountainous reliefs. We note the abundance of

Ordovician rocks represented by various schists including slate, sandstone and quartzite. The most dominant soils in the SBEI are skeletal ones.

From a climate perspective, the average annual rainfall in the study area ranges between 450-600 mm. Average annual temperatures vary between 1 and 34°C. The bioclimate is subhumid with a cold winter [3].

This SBEI is dominated by *Tetraclinis* stands in low altitude and in hot exposures, relayed by the Green oak in the areas relatively better watered and humid [3].

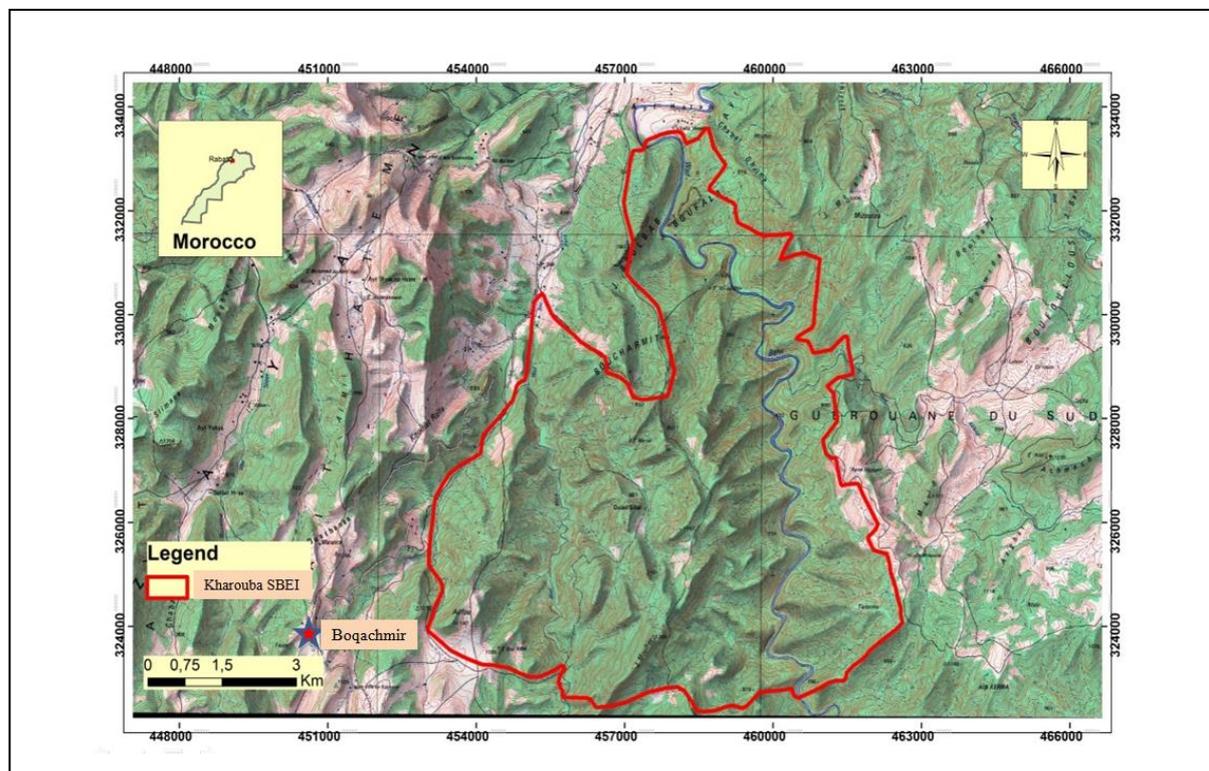


Figure 1: Kharouba BEIS location Map

To meet the objectives of this work, our methodology is based on an inventory of the Medicinal Plants existing at this site among a total of 145 floristic plants identified using qualitative floristic surveys (floristic list) and quantitative ones (Braun-Blanquet's scale of the coefficient of abundance-dominance [4]). Then, we proceeded to the taxonomic identification of different species collected, local and French names, medicinal uses of the species and the useful parts and this according to the Ethnobotanical surveys conducted with the users and the available bibliography [5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16].

3. Results and discussions

Floristic surveys conducted in the field have allowed us to create a catalog of 145 taxa. 52 of them are Medicinal Plants belonging to 33 botanical families and 49 genera. Figure 2 shows the proportions of the most represented families in the surveys. The *Asteraceae* is the most represented family in the SBEI with 16% of total species, *Apiaceae* with 12%, the *Fabaceae* (9%), the *Anacardiaceae* (9%) and the *Oleaceae* (9%). The other families are present with percentages less than 5%.

Among the medicinal plants encountered in the SBEI (annex), we state in this article 26 species which are the most important and the most used by the local population.

❖ *Adoxaceae*

- *Pistacia atlantica* Desf. (Btem, Pistachier de l'Atlas); rare to very rare.

Parts used: leaves and bark.

Medicinal properties and uses: antidiarrheal and stomachic [5].

- *Pistacia lentiscus* L. (Drou, Lentisque); very abundant.

Parts used: leaves and bark.

Medicinal properties and uses: emmenagogue, diuretic, astringent, antipyretic and analgesic [6].

- *Rhus pentaphylla* Desf. (Tizgha, Sumac vernis); moderately abundant.
 Parts used: leaves, bark, roots and fruits.
 Medicinal properties and uses: antidiarrheal [6].

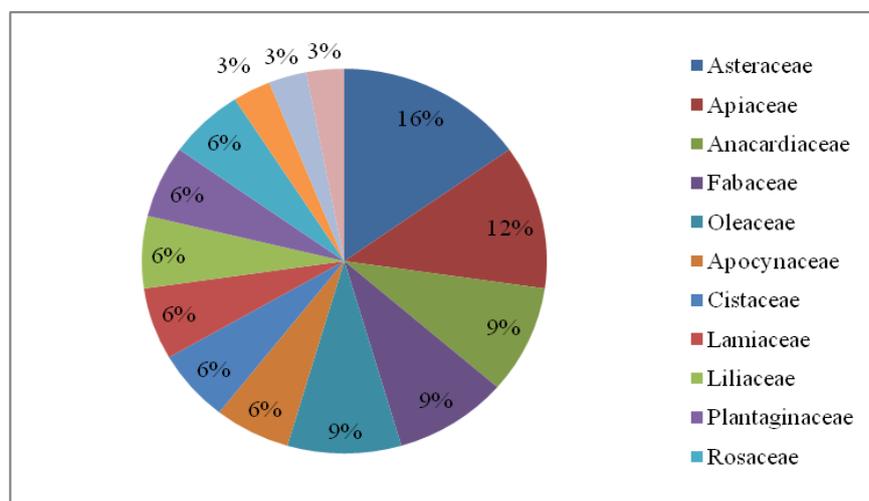


Figure 2: Proportions of the most represented families in studied site

❖ *Apiaceae*

- *Daucus carota* L. (Jazar or Khizou, Carotte cultivée); very abundant.

Parts used: roots.

Medicinal properties and uses: antidiarrheal, diuretic, depurative, hypoglycemic, emmenagogue and remineralizing [7].

- *Eryngium triquetrum* Vahl (Mrîzla, Panicaut); moderately abundant

Parts used: roots.

Medicinal properties and uses: used against intestines pain and cooling and against tonsillitis [5].

❖ *Apocynaceae*

- *Caralluma europaea* Guss. (Daghmous); moderately abundant.

Parts used: seeds and leaves.

Medicinal properties and uses: used in natural treatment for cysts and against cough, asthma and insomnia [8].

- *Nerium oleander* L. (Defla, Laurier rose); rare to very rare.

Parts used: leaves.

Medicinal properties and uses: used against headache and cold [9].

❖ *Areaceae*

- *Chamaerops humilis* L. (Dûm, Palmier nain); rare to very rare.

Parts used: roots and fruit.

Medicinal properties and uses: anti-diabetic and as a remedy for gastric and intestinal mucosal damage and against diarrhea and gingivitis [5].

❖ *Asteraceae*

- *Ormenis mixta* (L.) Dumort. (Hellâla, Camomille du Gharb); moderately abundant.

Parts used: flower.

Medicinal properties and uses: used against fevers and abdominal pains and to heal small wounds [5].

❖ *Cistaceae*

- *Cistus albidus* L. (Tuzzala, ciste blanc); very abundant.

Parts used: leaves.

Medicinal properties and uses: used against stomach pain as well as hypoglycemic and digestive [10].

❖ *Cupressaceae*

- *Tetraclinis articulata* (Vahl) Mast. (Ar'âr, Thuya de Berbérie); very abundant.

Parts used: leaves.

Medicinal properties and uses: used to heal wounds and as an emetic in various episodes of intoxication and as hypoglycemic [6].

❖ *Ericaceae*

- *Arbutus unedo* L. (Sasnu, Arbousier); moderately abundant.

Parts used: leaves and bark.

Medicinal properties and uses: anti-inflammatory, antiseptic, astringent, diuretic and purgative [5].

❖ *Euphorbiaceae*

- *Mercurialis annua* L. (Harrigua melsa, Mercuriale annuelle); rare to very rare.

Parts used: leaves.

Medicinal properties and uses: diuretic and purgative [5].

❖ *Fabaceae*

- *Ceratonia siliqua* L. (Kharoub, Caroubier); moderately abundant.

Parts used: pulp and seeds.

Medicinal properties and uses: Antidiarrheal, antipyretic and laxative [9].

❖ *Fagaceae*

- *Quercus rotundifolia* L. (Korrich, chêne vert); very abundant.

Parts used: fruit and bark.

Medicinal properties and uses: tonic and antidiarrheal [11].

❖ *Lamiaceae*

- *Lavandula multifida* L. (Kohîla, Lavande); moderately abundant.

Parts used: flowers.

Medicinal properties and uses: antiseptic, bactericidal, calming, antispasmodic, carminative [12].

- *Lavandula stoechas* L. (Halhal, Lavande stoechade) ; moderately abundant

Parts used: leaves and flowers.

Medicinal properties and uses: vulnerary, calcifying, cough, hypoglycemic, antiseptic, anti-catarrhal, anti-inflammatory [12].

❖ *Liliaceae*

- *Asphodelus microcarpus* Salzm. et Viv. (Berwag, Asphodèle); moderately abundant.

Parts used: bulbs.

Medicinal properties and uses: used against hemorrhoids and fungal infections [5].

❖ *Malvaceae*

- *Malva sylvestris* L. (Khobbeyza, Grande mauve); rare to very rare.

Parts used: leaves and flowers.

Medicinal properties and uses: used against chronic constipation, cough and acute bronchitis [13].

❖ *Myrtaceae*

- *Myrtus communis* L. (Rayhan, Myrte); rare to very rare.

Parts used: leaves.

Medicinal properties and uses: antiperspirant, tonic, antiseptic, astringent, sedative, expectorant and antidiarrheal [13].

❖ *Papaveraceae*

- *Papaver rhoeas* L. (Bela'man, Coquelicot); rare to very rare.

Parts used: whole plant.

Medicinal properties and uses: narcotic, antitussive and antispasmodic [14].

❖ *Plantaginaceae*

- *Globularia alypum* L. (Äin lerneb, Globulaire); rare to very rare.

Parts used: leaves.

Medicinal properties and uses: used in treatment of inflammatory skin diseases [15].

❖ *Rhamnaceae*

- *Zizyphus lotus* (L.) Lam. (Sedra, Jujubier); rare to very rare.

Parts used: fruits, leaves and roots.

Medicinal properties and uses: used in the case of leucomas, and upset stomach, diarrhea and heart failure [5].

❖ *Rosaceae*

- *Crataegus monogyna* Jacq. (Ze'rûr, Aubépine); rare to very rare.

Parts used: stem with leaves.

Medicinal properties and uses: antispasmodic, hypotensive and sedative [9].

- *Rosa canina* L. (Ward, Eglantier); rare to very rare.

Parts used: flower buds.

Medicinal properties and uses: used for the treatment of hair, it is also recommended in case of intestinal worms [16, 9].

❖ *Rutaceae*

- *Ruta chalepensis* L. (Sadâb, Rue); rare to very rare.

Parts used: leaves and stems.

Medicinal properties and uses: used against pain and cold and as a sedative [5].

The results show that most medicinal species are widely used in gastrointestinal, respiratory and circulatory system treatments. However, their uses as medicinal plants are limited to personal use by some local families. Commercial exploitations by regular harvesting are not practiced in this area.

As for, the used parts of the plants (figure 3), the ethnobotanical studies have shown that the leaves are the most used part with a percentage of 49%, followed by the fruits (17%), the roots (11%), and the seeds (11%). The remaining parts such stem, bark, bulbs and whole plant, are represented by a cumulative percentage of 11%.

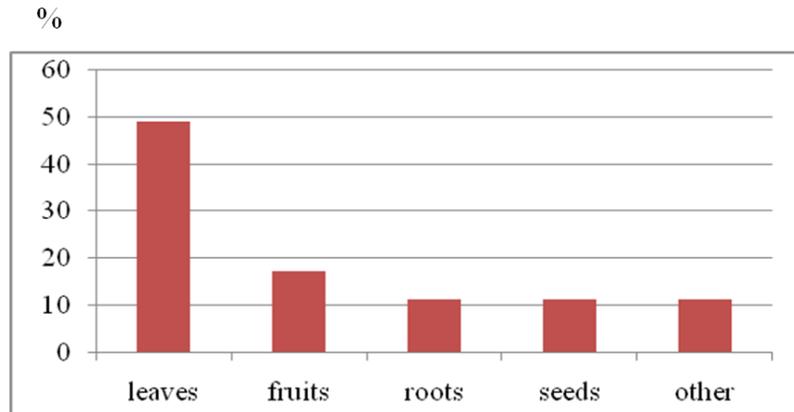


Figure 3: Plants parts used

The analysis of medicinal plants distribution according to the index of abundance-dominance shows that the number of rare medicinal plants in the BEIS amounted to 32 meaning 62% of the plants' total number. 6 medicinal plants are very abundant; they are *Tetraclinis articulata* (Vahl) Mast., *Quercus rotundifolia* L., *Pistacia lentiscus* L., *Olea europaea* L. var. *oleaster*, *Cistus albidus* L., *Asphodelus microcarpus* Salzm. et Viv. and *Daucus carota* L..

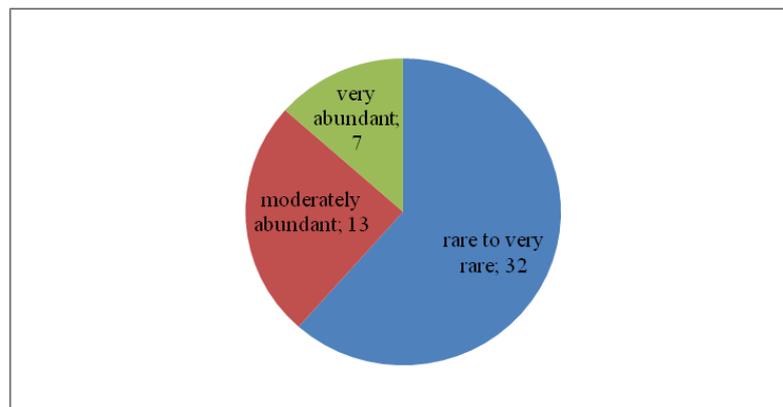


Figure 4: The analysis of medicinal plants distribution according to the index of abundance-dominance

Medicinal plants dynamics analysis in the Kharouba SBEI allowed highlighting the fact that there is an apparent alteration of the ecosystems. The major degradation factors are:

- The overgrazing : the overgrazing coefficient is estimated at 49% [3]; meaning an actual animal loading two times higher than the balance load;
- The anarchic harvesting of the medicinal plants: local users tend to sever the whole entire plant with its roots instead of just taking the desired parts; this is one of the causes the biodiversity degradation. Thereupon, strict conservation measures and actions must be taken to attenuate the impact of this practice on medicinal plants sustainability.
- An insufficient valorization of these resources caused by a lack of consideration. In fact, these medicinal plants have always been considered as secondary products and relegated when it comes to the development process of natural resources.

Conclusion

The Kharouba SBEI contains some of the most beautiful Tetraclinis stands of the whole Moroccan Central Plateau and provides an important floristic richness especially in terms of medicinal plants for up to 52 taxa. However, this diversified massif is under considerable anthropogenic pressures and excessive overgrazing threatening its functioning and sustainability. Thus, it would be most important to value these existing medicinal plants and develop their culture in the grounds surrounding the SBEI in order to offer an alternative source of income for local population and reduce at the same time the pressure on the medicinal plants including those rare and endangered.

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Annex

Medicinal Plants of Site of Biological and Ecological Interest (SBEI) of Kharouba

Family	Scientific name	Presence/Abundance in the SBEI
Amaryllidaceae	<i>Allium pallens</i> L.	rare to very rare
Apiaceae	<i>Ammi majus</i> L.	moderately abundant
Ericaceae	<i>Arbutus unedo</i> L.	moderately abundant
Asparagaceae	<i>Asparagus albus</i> L.	rare to very rare
Xanthorrhoeaceae	<i>Asphodelus microcarpus</i> Salzm. & Viv	very abundant
Cucurbitaceae	<i>Bryonia dioica</i> Jacq.	rare to very rare
Apocynaceae	<i>Caralluma europaea</i> (Guss.) N.E. Br.	moderately abundant
Gentianaceae	<i>Centaurium erythraea</i> Rafn.	rare to very rare
Fabaceae	<i>Cerantonia siliqua</i> L.	moderately abundant
Arecaceae	<i>Chamaerops humilis</i> L.	rare to very rare
Cistaceae	<i>Cistus albidus</i> L.	very abundant
Cistaceae	<i>Cistus salviifolius</i> L.	moderately abundant
Ranunculaceae	<i>Clematis cirrhosa</i> L.	rare to very rare
Rosaceae	<i>Crataegus monogyna</i> Jacq.	rare to very rare
Poaceae	<i>Cynodon dactylon</i> (L.) Pers.	moderately abundant
Apiaceae	<i>Daucus carota</i> L.	very abundant
Asteraceae	<i>Echinops spinosus</i> L.	rare to very rare
Ephedraceae	<i>Ephedra fragilis</i> Desf.	rare to very rare
Apiaceae	<i>Eryngium triquetrum</i> Vahl.	moderately abundant
Plantaginaceae	<i>Globularia alypum</i> L.	rare to very rare
Oleaceae	<i>Jasminum fruticans</i> L.	moderately abundant
Lamiaceae	<i>Lavandula multifida</i> L.	moderately abundant
Lamiaceae	<i>Lavandula stoechas</i> L.	moderately abundant
Fabaceae	<i>Lotus arenarius</i> Brot.	rare to very rare
Malvaceae	<i>Malva sylvestris</i> L.	rare to very rare
Euphorbiaceae	<i>Mercurialis annua</i> L.	rare to very rare
Myrtaceae	<i>Myrtus communis</i> L.	rare to very rare
Apocynaceae	<i>Nerium oleander</i> L.	rare to very rare
Oleaceae	<i>Olea europea</i> L.	very abundant
Asteraceae	<i>Ormenis mixta</i> (L.) Dumort.	moderately abundant
Papaveraceae	<i>Papaver rhoeas</i> L.	rare to very rare
Oleaceae	<i>Phillyrea angustifolia</i> L.	moderately abundant
Anacardiaceae	<i>Pistacia atlantica</i> Desf.	rare to very rare
Anacardiaceae	<i>Pistacia lentiscus</i> L.	very abundant
Plantaginaceae	<i>Plantago ovata</i> Forsk.	rare to very rare
Asteraceae	<i>Pulicaria odora</i> (L.) Reichenb.	rare to very rare
Fagaceae	<i>Quercus rotundifolia</i> Lam.	very abundant
Anacardiaceae	<i>Rhus pentaphylla</i> (Jacq.) Desf.	moderately abundant
Rosaceae	<i>Rosa canina</i> L.	rare to very rare
Rubiaceae	<i>Rubia peregrina</i> L.	rare to very rare
Rutaceae	<i>Ruta chalepensis</i> L.	rare to very rare
Asteraceae	<i>Scolymus hispanicus</i> L.	rare to very rare
Asteraceae	<i>Silybum marianum</i> L. Gaertn.	rare to very rare
Liliaceae	<i>Smilax aspera</i> L.	rare to very rare
Apiaceae	<i>Smyrnium olusatrum</i> L.	rare to very rare
Cupressaceae	<i>Tetraclinis articulata</i> (Vahl.) Masters.	very abundant
Liliaceae	<i>Urginea maritima</i> (L.) Baker	moderately abundant
Urticaceae	<i>Urtica dioica</i> L.	rare to very rare
Verbenaceae	<i>Vitex agnus-castus</i> L.	rare to very rare
Vitaceae	<i>Vitis vinefera</i> L.	rare to very rare
Rhamnaceae	<i>Ziziphus lotus</i> (L) Lam.	rare to very rare