

## INVENTORY OF ANTI-DIARRHEAL PLANTS IN THE OUANOUGHIA REGION (M'SILA, ALGERIA)

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**Abstract:** The anti-diarrheal medicinal flora of the Ouanougha region includes 41 species belonging to 20 botanical families and 35 genera. These families are mainly dominated by Lamiaceae (8 species), Anarcadiaceae, Fabaceae, Myrtaceae, Plantaginaceae and Rosaceae (3 species) and eight families containing two species and the other families are represented by one species. The leaves are the most used organ. The methods of preparation most frequently employed for the majority of remedies are decoction and infusion.

**Keywords:** Anti-diarrheal plant, inventory, ethnobotany, chorology, M'sila, Algeria.

### 1. Paper sections and font styles

Medicinal plants continue to meet an important need, despite the existence and influence of modern health systems, about 35,000 species of plants are used worldwide for medicinal purposes, which forms the largest range of biodiversity used by humans [1]. These medicinal plants are important for pharmacological research and drug synthesis not only when their constituents are used directly as therapeutic agent but also as raw material for drug synthesis or model for pharmacologically active compounds [2].

Medicinal plants constitute a precious heritage and a real treasure for humanity, and are in great demand in the world and more particularly in developing countries [3]. These medicinal plants are still a source of medical care in developing countries due to the lack of a modern medicinal system ([4].

Traditional herbal medicine was well developed in Algeria, but the use of conventional medicine is the cause of a neglect of these ancestral practices which risk falling into oblivion [13]. Alongside the programs of some international organizations such as the World Health Union (IUCN) which is interested in promoting the conservation of biodiversity and

the sustainable use of natural resources in North Africa, and also the involvement of local communities in the biodiversity conservation [4].

The objective of carrying out ethnobotanical surveys in the Ouanougha region is to obtain a floristic inventory of antidiarrheal medicinal plants used by the population and to collect as much information as possible on the therapeutic uses practiced in the study area. The preservation of this knowledge is a challenge for the conservation and development of resources and this within the framework of the sustainable development of the study area.

### 2. Materials and method

#### 2.1. Presentation of the study area

The study area is located in the north of the wilaya of M'sila and is limited to the north by Bordj Bou Arreridj and to the east by Hammam Dalaa, to the west by Beni Ilmane and Sidi Aissa and to the south by Tarmount and Sidi Hadjeres (Figure 1).

The Ouanougha region has no weather station. The closest posts are those of M'sila and Bordj Bou Arreridj. The average annual rainfall is 221 mm at the M'sila station, on the other hand it is 385 mm at the Bordj Bou Arreridj station.

The mountainous massifs receive larger quantities of water, of the order of 400–500 mm in the Saharan Atlas and which can reach more

than 600 mm in the Monts du Hodna and the Aurès-Belezma [5].



**Fig.1.** *Geographical location of the study area*

## 2.2. Ethnobotanical surveys

The ethnobotanical surveys on medicinal plants were carried out between March, April and May 2020 using 188 questionnaires, these surveys allowed us to draw up a list of anti-diarrheal species used by the population of Ouanougha in traditional herbal medicine.

The survey consists of asking questions to the villagers about the plants used in traditional medicine, the parts of the plant used, the methods of preparation, and the types of diseases treated by each plant.

The survey of herbalists makes it possible to draw up a list of spontaneous medicinal plants in the study area and others collected in wilayas bordering the wilaya of M'sila. This survey also allowed us to collect information on the vernacular names of the medicinal plants displayed for sale, the therapeutic uses, the dosage and the diseases treated by each plant. The survey of traditional healers shows that some family members have significant knowledge of plants of medicinal interest and have healing gifts.

The pharmacological knowledge of plants from traditional healers makes it possible to identify the basic concepts of the perception of the natural environment and the description of diseases [6].

## 2.3. Questionnaire sheets

The questionnaire sheet is a form made up of two parts, the first is based on the person surveyed

(age, sex, level of education and professional situation), the second part collects information concerning each medicinal plant studied, this information makes it possible to evaluate the knowledge of the plant, the use, the prescription and the method of preparation recommended by each of the people questioned.

## 3. Results and discussion

The results obtained from the ethnobotanical surveys are expressed in technical sheets which consist in highlighting the characteristics of the anti-diarrheal medicinal plants used by the population of the study area and those sold by the herbalists of Ouanougha.

The ethnobotanical survey of medicinal plants carried out with the population of the study area, and the collection of bibliographical data concerning therapeutic uses, allowed us to describe, classify, and inventory the anti-diarrheal medicinal plants, this floristic inventory highlight a floristic richness of 41 species belonging to 20 botanical families and 35 genera. The local population treats diarrhea with the leaves which constitute the most widely used plant organ and with the decoction which represents the most dominant mode of preparation.

The list of anti-diarrheal medicinal plants is presented in the form of a catalog classified according to the alphabetical letter of the botanical families.

***Pistacia atlantica* Desf.** (btem, Arabic; Atlas pistachio) **ANACARDIACEAE**

The leaves and the bark are used, in decoction, against stomach aches and gastric pains. Inhaled, the leaves are used as a febrifuge. The galls are used in powder form, alone or associated with tiger nut as an antidiarrheal and stomachic. Fruits are non-toxic at low doses [7,8].

***Pistacia lentiscus* L.** (drou, Arabian); lentisk, French) **ANACARDIACEAE**

The leaves and the bark are used, in decoction or powder, in the treatment of stomach and intestinal ailments, diarrhea and diabetes. The leaves have emmenagogue, astringent, diuretic, analgesic and antipyretic properties [6].

***Rhus pentaphylla* Desf.** (Tizgha; varnish sumac) **ANACARDIACEAE**

The leaves, roots and bark, in decoction, are used to combat gastrointestinal disorders. The fruits, fresh or dried, are used in the treatment of diarrhea [6].

***Cuminum cyminum* L.** (Cumin; Kamoun) **APIACEAE**

Powdered or absorbed with water, cumin seeds are recommended for diarrhea, menstrual pain and gastrointestinal disorders. As a poultice on the neck, cumin is used against mumps [9].

***Daucus carota* L.** (Cultivated carrot; Jazar or Khizou) **APIACEAE**

Anti-diarrheal, diuretic, depurative, hypoglycemic, aperitif, emmenagogue, remineralising. Cooked or raw, roots or carrots are recommended in case of diarrhoea. They are also used in the treatment of diseases of the urinary tract: renal colic and oliguria. As food, they promote visual acuity [9].

***Chamaerops humilis* L.** (Doum; saw palmetto) **ARECACEAE**

The resin, obtained from the plant, in infusion is deemed hypoglycemic and combats lung ailments [8]. Saw palmetto fruit is used against diarrhea.

***Phoenix dactylifera* L.** (Nkhel; Date palm) **ARECACEAE**

The fruit is renowned as an aphrodisiac and anti-diarrheal. The calcined stones, pounded and sieved, are used for eye care. Dates have undeniable nutritional value. They are fortifying, anti-anaemic, emollient and laxative [10].

***Opuntia ficus-indica* (L.) Mill.** (hendiya; prickly pear) **CACTACEAE**

The flowers, in infusion or better, ingested in powder, are used against diarrhea and hemorrhoids [11]. Non-toxic, but the ingestion of a large number of fruits leads to persistent and sometimes dangerous constipation [8].

***Atriplex halimus* L.** (Legtef; wild orach) **CHENOPODIACEAE**

The powder of the leaves is used against diabetes, pain in the intestines, pain in the kidneys, internal cancer (handful, 1 spoonful/glass). The crushed leaves, in decoction, are used as an antidiabetic and against intoxication. The leaves, in infusion, are used as antidiarrheal. The decoction of the leaves is administered against diabetes, kidney stones and cold (250g/1L) [12].

***Chenopodium ambrosioides* L.** (Mkhinza; Ambrine) **CHENOPODIACEAE**

Leaf powder is used against respiratory ailments and rheumatism. The juice prepared from the fresh leaves of Ambrine combined with orange is used to treat fever (3g/2 oranges). The powder, in decoction, is prescribed against cough, cold, fever and diarrhea (1 spoonful/glass). The leaf powder, in milk decoction, is recommended against fever (handful/glass) [12].

***Arbutus unedo* L.** (Lenj, bakhenti; Arbutus) **ERICACEAE**

The roots in decoction are used against hypertension and liver ailments [8]. Taking some fruits stops diarrhea.

***Ceratonia siliqua* L.** (Kharroub, salghwa; carob) **FABACEAE** The fruits, pulverized, combined with a little water are effective against constipation. A decoction of carobs or pulp freed from seeds is also used in bronchitis. The whole pods or the seeds alone are used mainly to combat diarrhea [6,8].

***Cicer arietinum* L.** (Chickpea; Hamous) **FABACEAE**

Aphrodisiac, invigorating, anti-venom, energetic, diuretic, antiseptic, urinary, vermifuge, emmenagogue, resolving, stomachic, tonic, restorative, antidiarrheal. Externally, chickpea powder is used to make maturing plasters. Mixed with melon or cucumber pulp is used to make softening facial masks. The roots in fumigation, are used there against the pains of the teeth and the gums. The seeds, macerated, are used against jaundice [9].

***Retama raetam* Webb.** (R'tem, retem, Genet blanc) **FABACEAE**

The vegetative part of the plant is healing (skin conditions, especially boils), advised to treat eye irritations, as well as to treat diarrhea, feverish illnesses and tapeworms [13].

***Quercus suber* L.** (Fernan; cork oak) **FAGACEAE**

The pulverized fruits, combined with honey, are used as a stomachic [8]. The bark located below the cork layer is used, under the name d'bagh, in

the regions where the cork oak grows, as a haemostatic and healing agent in the care of wounds, most often in powder form, sometimes in decoction. The powder is also used, orally, as an anti-diarrheal and in the treatment of stomach and colon diseases.

***Quercus rotundifolia* Lam.** (Karrouch; Holm oak) **FAGACEAE**

The roots, in decoction, are effective against fever [8]. In the forest of Achach and everywhere in Morocco, the bark of the holm oak is used in the same way as that of the cork oak, and in particular in the treatment of diarrhea and dysentery.

***Hypericum perforatum* L.** (St. John's wort) **HYPERICACEAE**

Mainly the flowering tops and the leaves are used. In internal use, St. John's Wort is used to fight against bronchitis, asthma, pulmonary ailments, atonic dyspepsia, diarrhea, cystitis, hepatic congestion, white discharge, oliguria, intermittent fevers, ailments origin, neuritis, circulatory insufficiency, obliterating arteritis and childhood infectious diseases [14].

***Juglans regia* L.** (Walnut) **JUGLANDACEAE**

Mainly the leaves, the trunk and the oil are used. Internally, Walnut is used to treat rickets, lymphatism, lymphadenopathy, scrofulosis, asthenia, bone diseases, tuberculosis, chronic bronchitis, diabetes, anemia, gout, rheumatism, diarrhea and tapeworm [14].

***Ajuga iva* (L.) Schreb.** (Ivette or Bugle; Chendgoura) **LAMIACEAE**

Depurative, warming, antidiabetic, vermifuge, anthelmintic, choleric, hypoglycaemic, astringent, antispasmodic, exciting, anti-diarrheal, appetizer, stomachic, anti-inflammatory, sedative, febrifuge, tonic, antiseptic, eupeptic, vulnerary, hypotensive. In decoction, or in powder added to the dough of bread, the musky ivet is recommended in the event of disorders of the digestive tract, in the event of the painful rules, and at the sterile women. The fresh leaves are pounded and the resulting liquid is heated and administered as a drop against ear ailments [9]. *Ajuga iva* is not toxic, but seems to have a certain sedative power [15].

***Marrubium vulgare* L.** (White Horehound; Merriwta) **LAMIACEAE**

Antidiabetic, febrifuge, emmenagogue, tonic, expectorant, hypoglycemic, bechic, thinner, cholagogue, aperitif, antiseptic, antipyretic, antidiarrheal, diuretic, anti-ctic, anti-typhoid,

stimulant, stomachic, cardiac sedative. In infusion, the horehound is administered in case of asthma, bronchitis, fever, lack of appetite, agitation, insomnia and difficult menstruation. In decoction, it is recommended in case of diabetes, diarrhea, intestinal worms and to beautify the hair. In ear drops, it is used against otitis. As a poultice on the temples, it is used against fever and on burst abscesses and boils in order to bandage and heal them [9].

Horehound essential oil is irritating to the skin and mucous membranes [16].

***Mentha spicata* L.** (N'anā; Mint) **LAMIACEAE**

Mint is used against digestive atony, indigestion, general fatigue, gastralgia, aerophagia, gastric and colic spasms, flatulence, diarrhea, cholera, intestinal parasites, gastrointestinal poisoning, hepatic affections, nervous vomiting, and the fetid breath of dyspeptics. It is also used against palpitations and dizziness, migraines, tremors, paralysis, insufficient or painful periods, asthma, chronic bronchitis, and tuberculosis [14].

***Mentha suaveolens* L.** (Marseta; Round-leaved mint) **LAMIACEAE**

A leaf decoction is highly valued in the treatment of gastric pain, diarrhoea, colds and respiratory ailments. As a poultice or inhaled, the leaves are recommended in case of fever. Abscesses and boils are treated with crushed leaves, or a leaf decoction. This last preparation, in mouthwash, would eliminate dental pain [17].

***Origanum compactum* Benth.** (Za'tar; Oregano with compact inflorescence) **LAMIACEAE**

The leafy stem, in infusion or decoction, is used against gastrointestinal complaints, diarrhea and as a hypoglycaemic. In gargle, it is employed against the affections of the mouth and, in inhalation, against the flu and the cold.

***Rosmarinus eriocalyx* Jord. & Fur.** (Woolly Calyx Rosemary) **LAMIACEAE**

Rosemary would therefore be recommended to treat various cases of asthenia. Leaves ; as an infusion, decoction, poultice or fumigation; are used against diarrhea, hepatic, respiratory (asthma), dermal (hair loss, edema, oily skin, wrinkles), nervous system and osteoarticular system.

***Rosmarinus officinalis* L.** (Azir; Rosemary) **LAMIACEAE**

Rosemary would therefore be recommended to treat various cases of asthenia. Leaves; as an infusion, decoction, poultice or fumigation; are used against disorders of the digestive tract

(diarrhea), hepatic (gallbladder, cholesterol), respiratory (asthma), dermal (hair loss, edema, oily skin, wrinkles), nervous system (depression, memory, migraine, nervousness, sleep) and the osteoarticular system (sprain, rheumatism, sciatica) [9].

***Teucrium polium* L.** (Jaâdiya; Germander)  
**LAMIACEAE**

The leaves and stems, in decoction, are very popular in the treatment of fevers, gastrointestinal disorders (enteritis, diarrhea, colic), abdominal pain (gastralgia), liver diseases (liver attack, biliary retention) and urogenital diseases. The powdered leaves, combined with henna, are applied to eczema; and fresh as a poultice on wounds [9]. Germander can cause nausea and chronic hepatitis in patients who use it regularly [6].

***Allium sativum* L.** (Thum; Garlic)  
**LILIACEAE**

Internally Garlic is used in the prophylaxis and treatment of infectious diseases (flu, typhoid, diphtheria), in the treatment of diarrhea and dysentery, lung diseases (tuberculosis, chronic bronchitis), asthma and emphysema, as well than whooping cough. It is also useful in cases of asthenia, cardiac fatigue, in the treatment of certain tachycardias, arterial hypertension, and other circulatory disorders. Garlic is also renowned in the treatment of arteriosclerosis, rheumatism, gout, urolithiasis and to fight against intestinal parasites (roundworms, pinworms, tapeworms) [14].

***Lawsonia inermis* L.** Henna (Arabic), Henna (French) **LYTHRACEAE**

The leaves are used in decoction against gastric pains. Macerated then reduced to a paste, they are used in local application for the treatment of the hair and the beautification of the hands and feet. In addition, the local application of henna is commonly used on eczema, boils, abscesses, cracks and bruises. The leaves are used as an infusion against diarrhea and renal lithiasis [6].

***Myrtus communis* L.** (Rihan; Myrtle)  
**MYRTACEAE**

Antiperspirant, purgative, tonic, antiseptic, astringent, balsamic, sedative, expectorant, hemostatic, antidiarrhetic. In a drinkable decoction, myrtle leaves are used as a remedy for respiratory ailments, diarrhea, stomach ailments and to treat bad breath in the form of a mouthwash. Compresses soaked in this decoction are applied to wounds, abscesses and bleeding hemorrhoids. The decoction mixed with henna is widely used to darken and soften the hair. The

fruit is chewed against gingivitis and mouth ulcers. The infusion is used to treat sinusitis by inhalation 3 times a day [9]. It is low in toxicity. However, its essence can cause headache and depression [18].

***Syzygium aromaticum* (L.) Merr. & LM Perry** (Qronfel, Le Clove, Clove)  
**MYRTACEAE**

Antiseptic, carminative, stomachic, tonicardiac, diuretic, antibacterial, analgesic, dermacaustic, stimulant, warming, revulsive, analgesic. Cloves are used as well as the essence obtained by steam distillation. Cloves are used to treat physical and intellectual asthenia, dyspepsia, gastric fermentation, flatulence, diarrhea, intestinal parasites, pulmonary conditions (tuberculosis), dental neuralgia and impotence. It is also used to prepare for childbirth and to prevent infectious diseases. For all this you can take 2 to 4 drops of Clove essence 3 times a day in honey or in alcoholic solution. You can also very simply use Cloves regularly in daily cooking [14].

It is used during gastric and intestinal cramps accompanied by gas. In toothaches and oral infections (canker sores, ulceration), cloves are chewed or applied as a powder poultice to the cheek. The clove is also used, in decoction in milk or sugar water, against menstrual pain, intestinal ailments and diarrhea. Associated with other plants, it is part of the composition of creams and oleates intended for hair care. Externally, macerated in rose water or lemon juice and applied as compresses to the forehead and temples, cloves are used to soothe headaches [9].

***Plantago albicans* L.** (Plantain)  
**PLANTAGINACEAE**

Softener, astringent, emollient, diuretic and laxative. Associate with the root of colocynth to make poultices in the care of wounds. Against diarrhea.

***Plantago ovata* Forsk.** (Tamret lagrab; Plantain) **PLANTAGINACEAE**

Plant used against gastro-duodenal ulcers and against diarrhea [6]. The leaves, in hydrolat, associated with rose water, are used to protect the skin of the face [8].

***Plantago psyllium* L.** (Assluj; Psyllium)  
**PLANTAGINACEAE**

Flea grass. The black seeds, in the shape of chips, soaked beforehand in milk overnight, are administered in all kinds of dysentery, gastro-uodenal ulcers, diarrhea [6].

***Hordeum vulgare* L.** (Chaa; Barley)  
**POACEAE**

Digestive, depurative, diuretic, anti-diarrheal, carminative. Soup prepared from barley (Balboula) is often recommended for fractured patients and diabetics. Roasted seeds are used as a carminative. Barley water is used as a gargle against throat ailments. It is also administered to children, in gastrointestinal diseases, and to adults in vesico-urinary irritations. Barley porridge is prescribed to breastfeeding women as it increases lactation [9].

***Cytinus hypocistis* L.** (Tertat; cytinet)  
**RAFFLESIAACEAE**

The plant is used in the treatment of diarrhea [6].

***Delphinium staphysagria* L.** (hab-bet ras; staphysaigre dolphinelle) **RANUNCULACEAE**  
The seeds, pulverized and combined with henna, are used as a poultice in hair care. The leaves, in decoction, are recommended against diarrhea and to inhibit milk production in women at the time of weaning. In high doses, the seeds are toxic [10,11].

***Ranunculus bullatus* L.** (wden the halluf; buttercup) **RANUNCULACEAE**

The roots, in decoction, are used against painful menstruation, stomach aches and to promote childbirth. The leaves are used as an infusion against diarrhea and renal lithiasis. The plant is irritating to the skin and mucous membranes. Ingested, it can cause stomatitis, burns and ulcerations [6].

***Reseda luteola* L.** (Al-lirún; Reseda dyers, sapling) **RESEDACEAE**

A leaf infusion is used against diarrhea, colic and digestive poisoning caused by ingestion of gris-gris (tawkal) [6].

***Agrimonia Eupatoria* L.** (Terfaq; Agrimony) **ROSACEAE**

Mainly leaves and flowers are used. Internally, Agrimony is used to treat diarrhea, dysentery, hemoptysis, renal colic, renal lithiasis, albuminuria, white discharge, diabetes, hepatism, obesity and asthma. For all this you can take tincture of Agrimony at the rate of 20 drops 2 times a day. Against urinary incontinence, white losses, diarrhoea, nephrolithiasis and glycosuria, you can take an infusion consisting of 30 to 50 g of Agrimony per liter of water. This infusion should be taken at the rate of one cup 3 times a day between meals [14].

***Crataegus oxyacantha* L.** (The Hawthorn)  
**ROSACEAE**

Hawthorn is used to treat palpitations, heart pain, angina pectoris, vascular spasms, tachycardia and

other arrhythmias, and hypertension. It is also used to treat congestive flushes, insomnia and other inconveniences of menopause, atherosclerosis, neurovegetative dystonia disorders (anxiety, dizziness, ringing in the ears), but also diarrhea, dysentery, and urinary and gallstones. For all this you can take it in the form of an infusion of one teaspoon of Hawthorn per cup of boiling water, to be taken at the rate of 2 to 3 cups per day [14].

***Rosa canina* L.** (ward, eglantine)  
**ROSACEAE**

Dried and pulverized flower buds are used, combined with myrtle, clove and henna for hair treatment. The decoction of flower buds is recommended in case of intestinal worms [10]. The rose is endowed with astringent, laxative, antidiarrheal, anti-inflammatory and stimulating properties [19].

## Conclusion

The ethnobotanical survey carried out on the basis of 188 questionnaires and the inventory of anti-diarrheal medicinal plants in the Ouanougha region are summarized in the form of a floristic list containing 41 species belonging to 20 botanical families and 35 genera. These families are essentially dominated by the Lamiaceae (8 species), the Anarcadiaceae, Fabaceae, Myrtaceae, Plantaginaceae and Rosaceae (3 species); eight families containing two species and the other families containing one species.

The leaves are the most used organ. The methods of preparation most frequently employed for the majority of remedies are decoction and infusion.

We speak of diarrhea if the stools are more liquid and more frequent than usual (more than 3 loose or liquid stools per day). Other signs may be associated such as nausea, vomiting, abdominal pain or even fever. The main danger of diarrhea is dehydration. The majority of short-term diarrhea is due to infection by viruses (Rotavirus, Norovirus, Adenovirus), also called "seasonal epidemic gastroenteritis".

It can be of bacterial origin by consumption of infected food (it will be commonly called "food poisoning") or can be due to parasites (unhygienic sanitary facilities). What to do in case of temporary diarrhea: during diarrhea, the body loses water and mineral salts. You must therefore compensate for these losses by drinking a lot of sweet and salty drinks (water, sodas, vegetable broths, etc.).

For your diet, choose foods that are easy to digest such as rice, cooked carrots... And avoid raw fruits and vegetables, frozen drinks and foods, spicy dishes.

Simple dietary rules are enough for the symptoms of diarrhea to disappear spontaneously within a few days. If your infant/child has diarrhea: give him oral rehydration solution (ORS) several times a day. Regularly offer your child to eat, and thus alternate ORS and food. Monitor him by regularly taking his temperature, his weight and noting the number of stools, the quantities drunk and his temperature. Attention the state of health of the young child can worsen in a few hours, especially if he is less than 6 months old. Remember that to prevent the onset of infectious diarrhea, have it on your hands several times a day.

## References

1. Fransworth, N., Akerele, O., Binget, A.S., Soejarto, D.D & Guoz : *Place des plantes médicinales dans la thérapeutique*. Bulletin de l'organisation mondiale de la santé, 1986, 64(2):159-164.
2. Gurib-Fakim, A.: *Medecinal plants: tradition of yesterday and drugs of Tomorrow*. Molecular Aspects of medicine, 2006, 27:1-93.
3. Salhi, S. & Fadli, M.: *Plantes médicinales de la ville de Kénitra (Maroc)*. Lazaroa, 2006, 31:131- 46.
4. Hseini, S. & Kahouadji, A. : *Etude ethnobotanique de la flore médicinales dans la région de Rabat (Maroc occidentale)*. Lazaroa, 2007, 28:79-92.
5. El Houerou, HN., Claudin, J. & Pouget, M.: *Étude bioclimatique des steppes algériennes (avec une carte bioclimatique à 1/1 000 000)*. Bull Soc Hist Nat Afr Nord Alger, 1977, t. 68, fasc. 3 et 4: 33-75.
6. Bellakhdar, J. : *La pharmacopée marocaine traditionnelle. Médecine arabe ancienne et savoirs populaires*. Ed. Le Fennec, Casablanca/ Ibis Press, Paris, 1997, 764 p.
7. Benchaabane, A. & Abbad, A. : *Les plantes médicinales commercialisées à Marrakech*. Ed. Info, Marrakech, 1997, 74 p.
8. Kahouadji, M.S. : *Contribution à une étude ethnobotanique des plantes médicinales dans le Maroc oriental*. Thèse de troisième cycle. Univ. Mohammed I. faculté des sciences, Oujda. 1995, 206p.
9. Tahri, N., El Basti, A., Zidane, L., Rochdi, A. & Douira, A. : *Etude ethnobotanique des plantes médicinales dans la Province De Settat (Maroc)*. Kastamonu Univ., Journal of Forestry Faculty, 2012, 12 (2): 192-208.
10. Mouhib, M. & El Omari, Z. : *Nos plantes médicinales, emploi en médecine moderne, en homéopathie, en médecine populaire*. Ed. Copiste, Casablanca, 1988, 158 p.
11. Sijelmassi, A. : *Les plantes médicinales du Maroc*. 3 ème édition Fennec, Casablanca, 1993, 285p.
12. Ghourri, M., Zidane, L., El Yacoubi, H., Atmane, R., Fadli, M. & Douira, A. : *Etude floristique et ethnobotanique des plantes médicinales de la ville d'El Ouatia (Maroc Saharien)*. Kastamonu Üni., Orman Fakültesi Dergisi, 2012, 12 (2): 218-235.
13. Rebbas, K., Bounar, R., Gharzouli, R., Ramdani, M. , Djellouli, Y. & Alatou, D. : *Plantes d'intérêt médicinale et écologique dans la région d'Ouanougha (M'Sila, Algérie)*. Phytothérapie, 2012, DOI 10.1007/s10298-012-0701-6
14. Morigane : Grimoire des plantes. 2007, 92p. <http://creativecommons.org/licenses/by-nc-nd/2.0/be/>
15. Bennaghmouch, L., Hajaji, N., Zellou, A., & Cherrah, Y.: *Etude pharmacologique d'Ajuga iva*. Ann. Pharm. Franç, 2001, 59(4), p. 284.
16. Ben Gueddeur, I. : *Etude in vitro de l'activité antimitotique de certaines plantes médicinales*. Thèse de pharmacie, 1, Rabat, 2002, 117p.
17. Boukef, M.K. : *Médecine traditionnelle et pharmacopée : les plantes dans la médecine traditionnelle tunisienne*. A.C.C.T, Tunisie, 1986, 350 p.
18. Charnot, A. : *La toxicologie au Maroc*. Mémoire de la société des sciences naturelles au Rabat (Maroc). Edition Siège de l'I. S, Rabat, 1945, 717p.
19. Kamal, H. : *Les plantes médicinales de la région de Taounate, Etude ethnobotanique et utilisation thérapeutiques*. Thèse de pharmacie, 4, Rabat, 1997, 184p.





**Fig. 2.** General view of the Ouanougha landscape (Top photo: Olive grove fields, bottom photo: Green oak grove) Photos: K. Rebbas