



Research Article

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**Ethnobotanical survey on four aromatic and medicinal plants from Masmouda/Ouazzane region (Morocco): *Clinopodium nepeta* (L.) Kuntze, *Lavandula multifida* L., *Mentha pulegium* L. and *Centaurium erythraea* Rafn**

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**ABSTRACT**

An ethnobotanical study on aromatic and medicinal plants was conducted in Masmouda district (Moroccan North-west). It was performed as a contribution to emphasize four Moroccan aromatic and medicinal species : *Clinopodium nepeta* (L.) Kuntze called Mantha, *Lavandula multifida* L. called Hlihla or lakhama, *Mentha pulegium* L. called Fliyou and *Centaurium erythraea* Rafn called Gasat elhaya. Ethnobotanical survey was carried out on the spot during two seasons (January and March) using a questionnaire filled by herb-sellers, traditional healers and users. Our work focused on gathering all information related to therapeutic practices done by Masmouda local population about these four medicinal species. Results showed that knowledgeable people regarding virtues of these plants are composed of 76% of women and 24% of men. The study also revealed that people without income (64%) as well as illiterate people (72%) do have a strong link with traditional medicine. Decoction is the main mode of preparation for *Clinopodium nepeta* (L.) Kuntze, *Lavandula multifida* L. and *Mentha pulegium* L. while powder aspect is generally used for *Centaurium erythraea* Rafn. Leaves and flowers of these plants are the most used organs in traditional phytotherapy. By the way, *Centaurium erythraea* Rafn is especially intended to treat skin diseases, *Mentha pulegium* L. to treat respiratory diseases while *lavandula multifida* L. is devoted to digestive diseases and *Clinopodium nepeta* (L.) Kuntze is particularly used against respiratory and gastric diseases. Results of this study constitute a precious source of information for the study area. They could be a data basis for further researches in the field of phytochemistry and pharmacology with in order to find new natural substances designed as phytomedicine.

**Keywords:** Ethnobotanical survey, aromatic and medicinal plants, phytotherapy, traditional medicine, Masmouda /Ouazzane

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**INTRODUCTION**

Vegetal world is full of virtues where human beings take not only food from, but also active substances that often give benefits to his organism which is sometimes affected by insidious troubles [1]. For centuries and even millennia, our ancestors used to relieve their pains, cure their diseases and dress their wounds with plants. From generation to generation, they have transmitted their knowledge and experiences striving to keep to it on a written way when they were able to do so. Thus, even now, despite progress in pharmacological field, therapeutic uses of medicinal plants is still important in certain countries and particularly in developing countries when modern medical system is not found [2]. In fact, on earth it has been reported about 500.000 vegetal species and medicinal properties have been attributed to 80.000 of them [3]. As other areas in the world, Morocco is a real tank of phytogetic

resources with about 4500 species and sub-species of vascular plants [4]. In fact, traditional medicine has always been important in Moroccan pharmacopeia.

This study performed as a survey in Masmouda region, aims to study the relationship between human beings and plants. It also aims to gather most information as possible regarding therapeutic uses executed by local people concerning four aromatic and medicinal plants that are: *Clinopodium nepeta* (L.) Kuntze, *Lavandula multifida* L., *Mentha pulegium* L. and *Centaurium erythraea* Rafn. Since it is very important to translate this traditional knowledge into a scientific one in order to revalorise it, to keep it and to use it rationally and in a modern way, this work should be considered as a contribution to do so.

## EXPERIMENTAL SECTION

### Study area

Masmouda region is located 15.5 kilometres south from Ouazzane province. With 12 villages, Masmouda region extends over 150 Km<sup>2</sup> with an estimated population of 26295 inhabitants in 2014. Among these 12 villages, we have conducted our study at Douar Rihiyin, Douar Oulad Bouhamou and Douar Remal (Picture1).



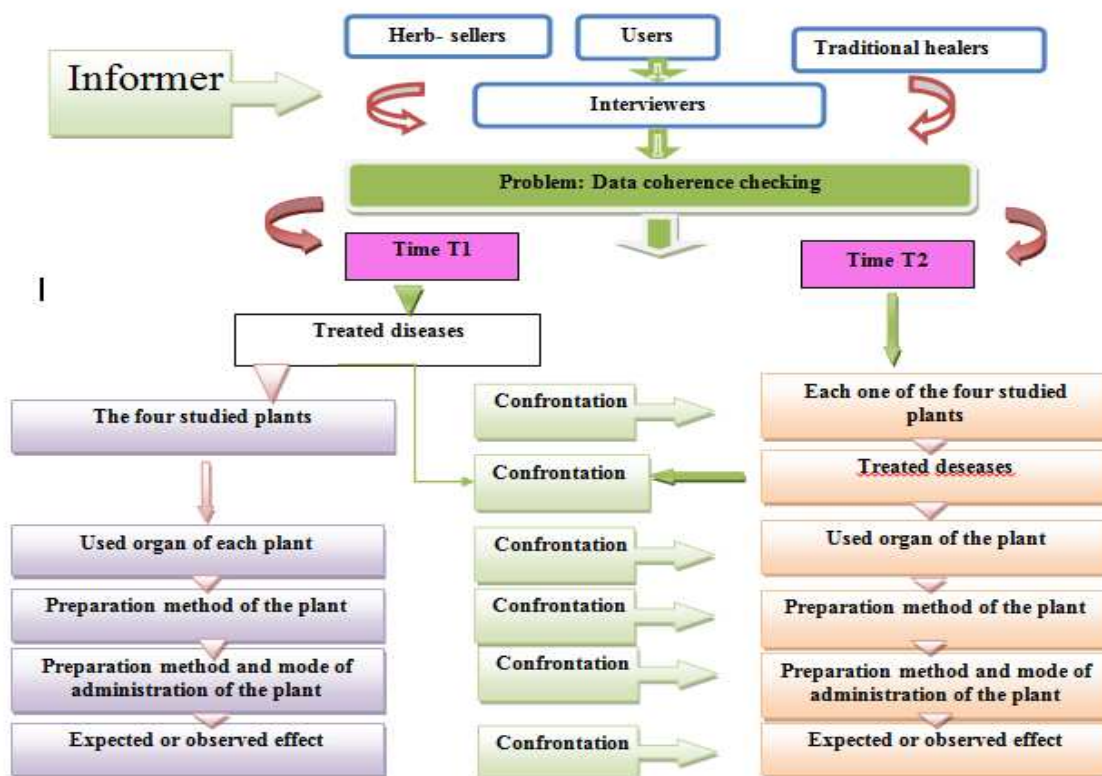
Picture 1: Study area (Morocco - Ouazzane - Masmouda)

### Ethnobotanical Survey

This ethnobotanical survey was conducted using 50 questionnaire sheets (Appendix1) during two seasons (January and March 2014), filled by informers (traditional healers, herbalists and users of medicinal plants) who age over than18. The survey primarily served to collect information about informers' profile: gender, educational level, marital status and occupation. Then, we focused on traditional uses of the selected medicinal plants. Identification of plant specimens was made at the Botanical Laboratory in the Scientific Institute of Rabat by Professor BENTATOU.

For a better analysis of answers obtained from the survey, we chose to statistically assess them with R software that allowed us to perform a series of operations in a short time.

Attention was paid to variability and / or recurrent aspect of the information from one person to another and from one village to another. Data were verified in the space by comparing them from different villages and verification in the time was realised by confronting comments of informer from the same village. Coherence of information was also checked in the space and in the time (Picture 2). Information is considered coherent when it is reported at least twice in two different villages and by different informants. Recurrence and convergence of information were also sought and verified. For a given plant, coherence is checked for information related to botanical and vernacular identities, used organ according to life cycle, method of preparation and administration mode of the cure [5]



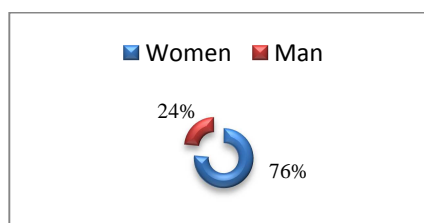
Picture 2: Study of coherence and convergence concerning the collected information

## RESULTS AND DISCUSSION

Results after treatment are presented in tables and graphs. They are related to gender, educational level, uses of the plants, preparation methods, used organs, type diseases to treat, administration mode, daily dose, frequency of daily use and possible combinations of the selected plants with other plants or products.

### Data analysis regarding informers' profile

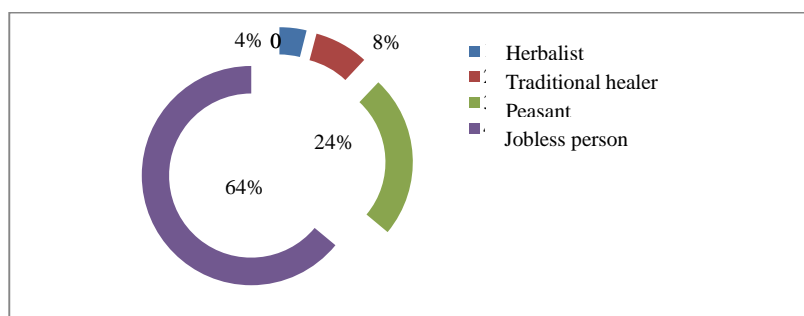
#### Distribution of informers by sex



Picture 3: Distribution of informers by sex

In the study area, we note that women are more knowledgeable compared to men, 76% against 24% about the subject of our study (Picture 3). This can be explained by the fact that women have to take care of their family. They strive to relieve the pain of their children and to keep the whole family healthy, thus they benefit more from medicinal properties of plants. These results confirm the data obtained by other ethnobotanical works conducted in Morocco [6].

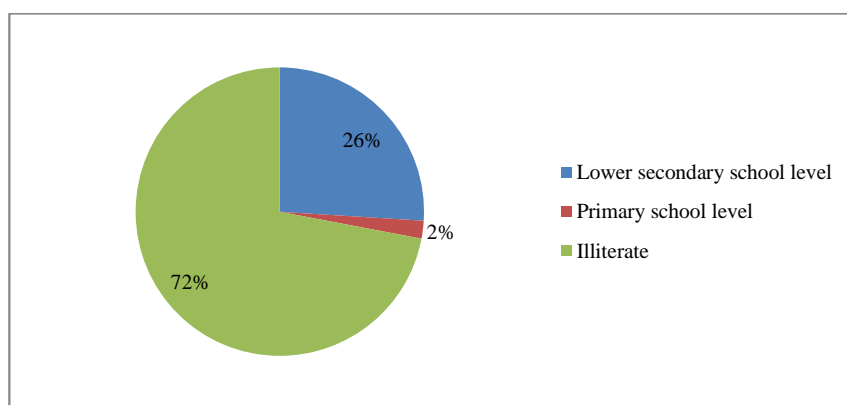
**Distribution of informers by activity**



**Picture 4: Frequency of informers by activity**

Considering the lack of health coverage and the excessive cost of drugs, people with limited monthly income are forced to use traditional herbal medicine. Results obtained in our ethnobotanical survey actually show that people with no income (64%) are more interested in traditional medicine (**Picture 4**).

**Distribution of informers according to educational level**



**Picture 5: Frequency of informers according to the level of study**

We note that users of medicinal plants in MASMOUDA region are mostly illiterate (72%). These results are not surprising since illiteracy rate is generally higher in rural areas. This fact is certainly linked to family poverty and the lack of transport means and infrastructures (**Picture 5**).

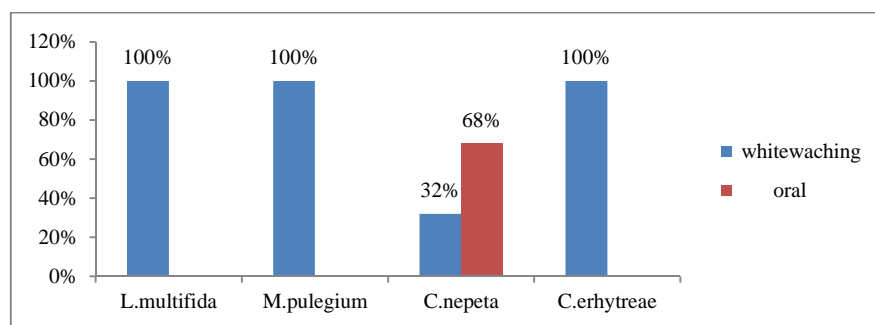
**Data analysis regarding aromatic and medicinal plants uses**

**Plants classification**

The following table (Table 1) shows the various names used to identify the plants.

**Table 1: Plants classification**

Scientific names	English names	Vernacular names
<i>Lavandula multifida</i> L.	Lavender	Lakhzama, Hlihla, Lakhila
<i>Mentha pulegium</i> L.	pennyroyal	Fliyou
<i>Clinopodium nepeta</i> (L.) Kuntze	Mint Mountains	Mentha
<i>Centaureum erythrea</i> Rafn	Lesser knapweed	Gasate lhaya

**Administration routes****Picture 6: Frequency of administration modes**

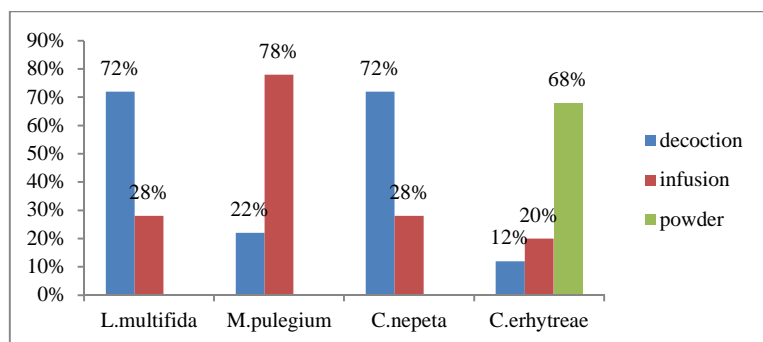
Oral administration is the sole route for *L.multifida* L., *M. pulegium* and *C.nepeta* while *C.erythraea* is administered by whitewashing. It also important to notice that administration mode depends on the type of use (internal or external) (Picture 6).

In order to study independence between the plants we have performed “ $\chi^2$ ” statistical test that compares the results of the four plants.

For the mode of administration; “ $\chi^2$ ” test gave a value of  $P = 2.2 \cdot 10^{-16}$  meaning that difference in administration mode is highly significant. We can conclude that the four plants are not administered in the same way.

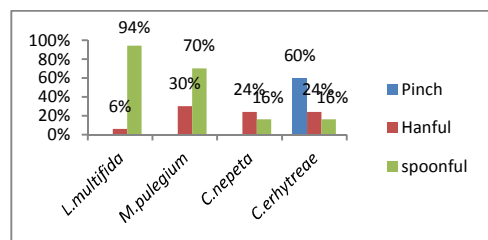
**Preparation methods**

Decoction is the major preparation mode for *C.nepeta* and *L. multifida* (72%)(Picture 7). According to local people, this type of preparation allows them to benefit from plant virtues. For *P. Mentha* L., infusion is the most common method (78%). As a testimony, an interviewee affirmed that an infused tisane in a covered container allows benefiting from volatile constituents. Although, infusion and decoction are the main means to prepare remedies, it seems that the plants could be used in other ways; other authors found that *M. pulegium* can be administered as thoracic poultice and inhalation [7] or fumigation [8].

**Picture 7: Use frequency of preparation modes**

For *Centaurium erythraea* Rafn, the powder is mostly used; this species is used for other purposes (Picture 7) such as fighting against mosquitoes: in this context the powder is hanged to drive insects away.  $\chi^2$  test showed  $P = 2.2 \cdot 10^{-16}$ , which means that the test is highly significant there is a diversity in the method of preparation: the four plants are not prepared in the same way.

## Dosage



Picture 8: Dosage frequency for each plant

Consumers of medicinal plants in the Circle of Masmouda do use the species using non-precise doses (pinch, handful, and spoonful): dosage remains uncertain. These results confirm those obtained by another author [9]. “ $\chi^2$ ” test gave the following results:  $P = 2.2 \cdot 10^{-16}$ , we can deduce that the four plants are not administered at the same dose.

## Daily use frequency

All selected plants are used once a day (Table 2). This frequency of use shows that they have very important pharmacological properties. For “ $\chi^2$ ” test,  $P = 1$ , we can say that the plants are administered at the same daily rate.

Table 2: Frequency of daily use (in %)

Aromatic and Medicinal Plants	Once / day	Twice / day	Thrice / day	other
<i>L. multifida</i> .	100	0	0	0
<i>C. erythraea</i>	100	0	0	0
<i>M. pulegium</i>	100	0	0	0
<i>C. nepeta</i>	100	0	0	0

## Therapeutic uses :

All plants are used for therapeutic purposes. However, *Centaurium erythraea* is also used as an insecticide against mosquitoes (Table 3).

Table 3: Frequency (in %) of plants uses according to purposes

	<i>L. multifida</i> .	<i>C. erythraea</i>	<i>M. pulegium</i>	<i>C. nepeta</i>
Therapeutics	100	94	100	100
Cosmetics	0	0	0	0
other	0	6	0	0

Indeed, therapeutic uses of plants are known since ancient times. This use is also in a context where individuals seek to recover a harmonious relationship with their environment.  $\chi^2$  test showed  $P = 0.06$ , thus, we can conclude that the result is not significant for that *Centaurium erythraea* is used for other purposes such as fighting against mosquitoes (insecticidal activity).

## Eventual combinations

From the survey, we noticed that three species; *Mentha pulegium* L., *Clinopodium nepeta* (L.) Kuntze and *Centaurium erythraea* Rafn, may be combined with other plants or other products. Indeed, for *Clinopodium nepeta* (L.) Kuntze, all interviewees claimed its association with tea and 26% of them affirmed its association with *Mentha pulegium* L. For *Centaurium erythraea*, 20% of interviewees revealed its association with honey for the treatment of diabetes. This combination is surprising since honey is not indicated for diabetics but further scientific studies may explain chemical reactions that occur between plant components and honey in order to highlight benefits of this association (Table 4).

Table 4 : Frequency of combinations

Plants	Plants (exclusively)	Combinations
<i>L. multifida</i> .	100	0
<i>C. erythraea</i>	80	20
<i>M. pulegium</i>	74	26
<i>C. nepeta</i>	0	100

P value of the  $\chi^2$  test was  $P = 2,2 \cdot 10^{-16}$ , thus, not all selected plants can be associated with other plants or products.

### Used organs

Leaves and flowers are the most used organs in traditional phytotherapy in MASMOUDA for the selected plants (Table 5). A study affirmed the use of flowering tops of *C. erythraea*, and *C. nepeta*, leaves and flowers of *M.pulegium*, and flowers as well as flowering tops of *Lavandula multifida* [10].

**Table 5: Use frequency of plants organs**

	Stem	Flowers	Fruits	Seeds	Bark	Roots	Flowers and leaves	Whole plant	Leaves
<i>L.multifida.</i>	0	0	0	0	0	0	100	0	0
<i>C.erythraea</i>	0	0	0	0	0	0	72	28	0
<i>M.pulegium</i>	0	0	0	0	0	0	100	0	0
<i>C.nepeta</i>	0	0	0	0	0	0	100	0	0

We found in our survey that these organs are picked in an anarchic way by local people. This practice may have negative effects on biodiversity preservation. It can lead to scarcity and even to the risk of total loss of species [11]. Hence, in order to respect this natural heritage, we need to change users' habits towards medicinal plants.

For  $\chi^2$  test:  $P = 2.2 \cdot 10^{-16}$ , so the result is highly significant which means that therapy by this four plants is not made using the same organs.

### Diseases to treat

#### Respiratory diseases

Pennyroyal (*Mentha pulegium* L.) and mountain mint (*Clinopodium nepeta* (L.) Kuntze) (Table 5) were found to be the most recommended species by local population of Masmouda. These species are found around Morocco in damp places. They are well known in the area of the study for their effectiveness in treating cold, bronchitis, lung infections, cough, etc. A study showed that pennyroyal (*Mentha pulegium*) works as a refreshing and lung antiseptic while *Clinopodium nepeta* is an expectorant [9].

**Table 5: Frequency of plants use by disease types**

	<i>L.multifida</i>	<i>C.erythraea</i>	<i>M.pulegium</i>	<i>C.nepeta</i>
Skin diseases	0	30	0	0
respiratory diseases	0	0	37	50
Heart diseases	0	0	0	0
uro- genital tract diseases	0	0	0	0
osteo-articular diseases	0	0	0	0
metabolic diseases	0	4	0	0
digestive tract diseases	50	16	13	0
neurological diseases	0	0	0	0
Oral diseases	0	0	0	0

#### Diseases of the digestive system

Among the most common species used in the treatment of digestive system diseases in Masmouda region (Table 5), lavender (*Lavandula multifida* L.) ranks first. This plant has the power to treat digestive infections according to another study [12], wounds, diabetes, cold, and respiratory diseases [13]. Then come Centaury and pennyroyal that also have the power to treat digestive diseases.

#### Skin and metabolic diseases

Centaury ranks first in the area of the study for the treatment of burns and skin damages. Its leaves and flowers are essentially used in powder to cure skin damages that result from a burn injury or a lesion. This miraculous plant is very important in herbal medicine in Masmouda region since it treats diabetes while its powder mixed with honey is used to cure skin ailments (one teaspoon per day on an empty stomach). Centaury is also important in Moroccan pharmacopeia: it is antipyretic [14-15], anti-inflammatory [14], and antimutagen on *Salmonella typhyrum* [16]. Moreover, it was shown that centaury has diuretic activity [17], and it is also hepatoprotective, [18] insecticide [19], [20], antibacterial [21], and antioxidant. [22].  $\chi^2$  test showed  $P = 2.2 \cdot 10^{-16}$ , this result is very significant. What implies that these four plant species are used for different therapeutic purposes.

### CONCLUSION

This ethnobotanical study revealed the importance of herbal medicine practices by Masmouda's insulated population. Gathering and synthesis of collected data helped to contribute moving from popular oral knowledge to a written knowledge. Emphasizing in pharmacological and industrial fields would be a way to ensure improvement from traditional medicine to modern medicine for a renovated pharmacopeia. This should be done in a greater

homogeneity, a greater efficiency and a reduction of plant toxicity. Improvement should not aim uprooting, but development and promotion of this cultural heritage. That will ultimately enhance biodiversity and contribute to development and welfare of local populations. A coherent study between phytochemistry, pharmacology and popular uses of these plants will contribute to the promotion of this cultural heritage. Medicinal plants play an important role in Moroccan pharmacopeia; it is therefore a need to valorise this natural heritage.

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### Appendices: Questionary.

#### I. Informer:

- Sex: Man  Women
- Level of study: Illiterate  Lower secondary school level  Primary school level
- Activity: Pessant  Herbaliste  Tradional healer  Jobless person

#### II. Rootstock:

- Scientific names: .....
- English names: .....
- Vernacular names: .....
- Therapeutic uses: Therapeutics  Cosmetics  Other
- Eventual combinations : Plants (exclusively)  Combinations : .....
- Used organs : Stem  Flowers  Fruits  Seeds  Bark  Roots  Flowers and leaves  Whole plant  Leaves



- Preparation methods: Infusion  Décoction  powder  Other : .....
- Dose :Pinch  Hanful  Spoonful

**III. administration modes:**

- Oral  Massage  Rinsing  whitewaching  other : .....
- **Daily use frequency:** Once/ day  Twice / day  Thrice / day  other :.....

**IV. Utilisation:**

Type of disease:

- Skin diseases
- Respiratory diseases
- Heart diseases
- Uro- genital tract diseases
- Osteo-articular diseases
- Metabolic diseases
- Digestive tract diseases
- Neurological diseases
- Oral diseases