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## Valuation of aromatic and medicinal plants (AMP) of Rif (Northern Morocco)

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### ABSTRACT

*In this study we present the importance of aromatic and medicinal plants (AMP) for the sustainable development of the Rif. Thus, several wild plants bio have been distilled, and essential oils obtained were analyzed by gas phase chromatography (GPC) to qualify their chromatographic profile. Similarly, we have studied the economic yield in function of the number of days of work that could generate a small exploitation of these natural resources. The results obtained show that the valuation of AMP in the Rif, could create several days of work per year around the different activities and different processes: : the gathering in the framework of cooperatives already existing, the distillation of plants, the conditioning of the essential oils as well obtained, then the activities of formulation of soaps, creams and even perfumes sold to local and national scale as product cosmetics, and to the international scale as basic product for the aromatherapy. Our University Mohamed 1<sup>st</sup> has the human and material resources to accompany this kind of project. Indeed, in addition to the human skills, our university has an infrastructure adapted to the training, awareness and the physicochemical analyzes in this field, which would without doubt contribute to the installation and the development of new businesses in this sector. In addition, our research team already has experience on the ground since it works with a cooperative and a local association. This innovative initiative can be extended to other regions of Morocco.*

**Key words:** plants, essential oil, distillation, valorisation

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### INTRODUCTION

The sector of aromatic and medicinal plants has known, since the beginning of the years 90, a development of increasingly supported and currently represents, at the global level, a market of several billion dollars.

Morocco has an important heritage of these products, most of which are unfortunately not valued, and this despite the great efforts of the public authorities including the creation of an institute of medicinal and aromatic plants (Inpma) to Taounate.

The present work carried out in collaboration with the association of solidarity and protection of environment which is located in the province of Al-Hoceima, a region with a high potential for AMP has for objective to contribute to the development of a sector of activity the more lucrative, once organized.

The lack of data on the region, does not allow a good diagnosis and a comprehensive assessment of the key opportunities and constraints to the development of the sector of aromatic and medicinal plants, taking into account the local specificities. This is why we believe that it is essential to begin by constitute a database to understand the current use artisanal these local natural resources, the exploitation of species of priority interest, the valorization of the productions and the improvement of the quality, by the standardization of the various stages of

production (harvest, transport, drying, distillation, packaging) and marketing of products and by-products as well to the national and international level.

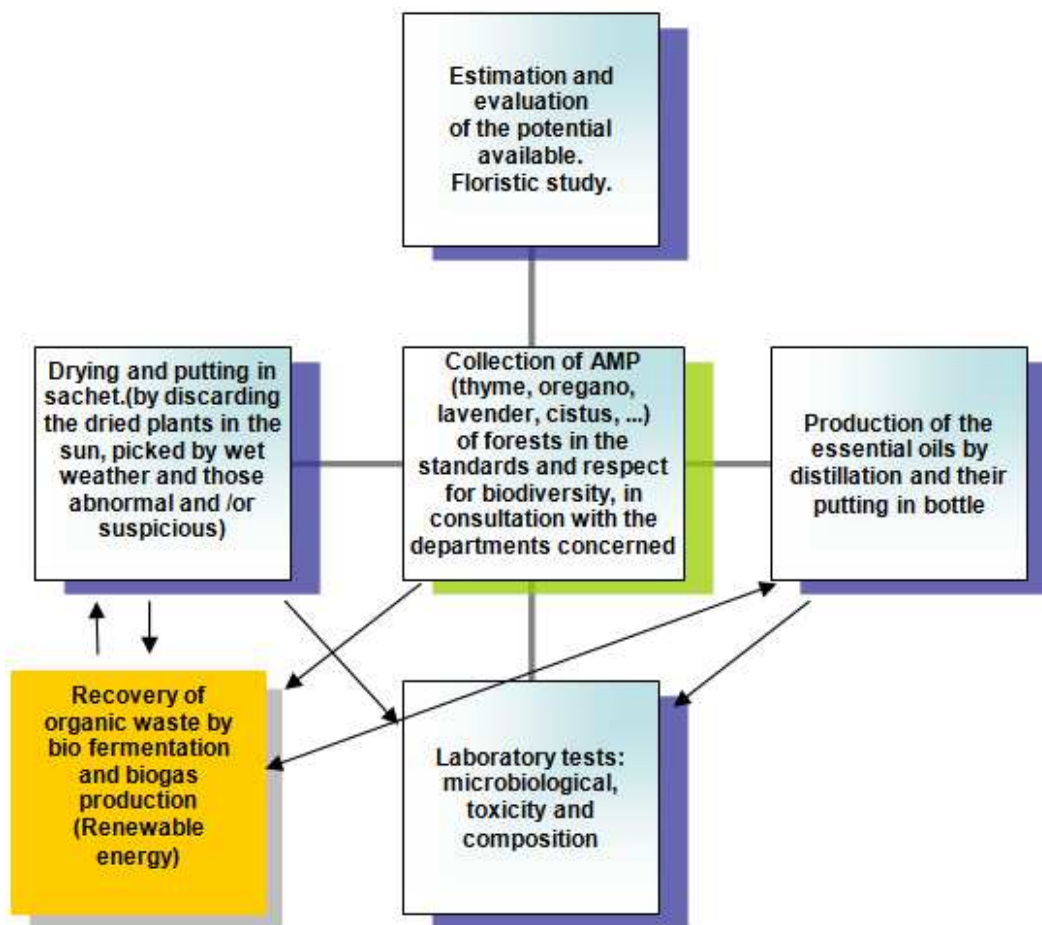


Figure 1: The different activities and the multidisciplinary aspect of the development of the sector of AMP.

### MATERIALS AND METHODS

Table 1: Technical sheet of exploitation of a few AMP from the forest of the rif (Bio)

Plant	Harvest period	Performance in EO (of dry plants)
The Thyme Family: Lamiaceae Genus and species: <i>Origanum</i>	February - March	0.5%
The Ciste Family: Cistaceae Genus and species: <i>Cistus ladaniferus</i>	June - July	0.35%
The white Sagebrush Family: Compositae Genus and species: <i>Artemisia vulgaris</i>	May - June	2%
The lavender Family: Lamiaceae Genus and species: <i>Lavandula</i>	March - May	0.7%

#### 1.1. Equipment

- Device for the distillation of AMP: total volume 400 liters, including a stainless steel alambic, a cooling coil and a tank of cold water.
- Raw material: sheets of AMP: juniper, eucalyptus, lavender, oregano, thyme.

## 1.2. Method

### 1.2.1. Preparation of the raw material for the hydro distillation

Picking of leaves, triage, weigh between 20 and 65 kg.

### 1.2.2. The Yield calculation of essential oils "EO"

Table 1 below shows the yields in % of some plants

### 1.2.3. Characterization of essential oils "EO"

The valorization of aromatic and medicinal plants of rif (AMP) passes first by an analysis of the physicochemical properties of their essential oils and then by the determination of their chemical compositions.

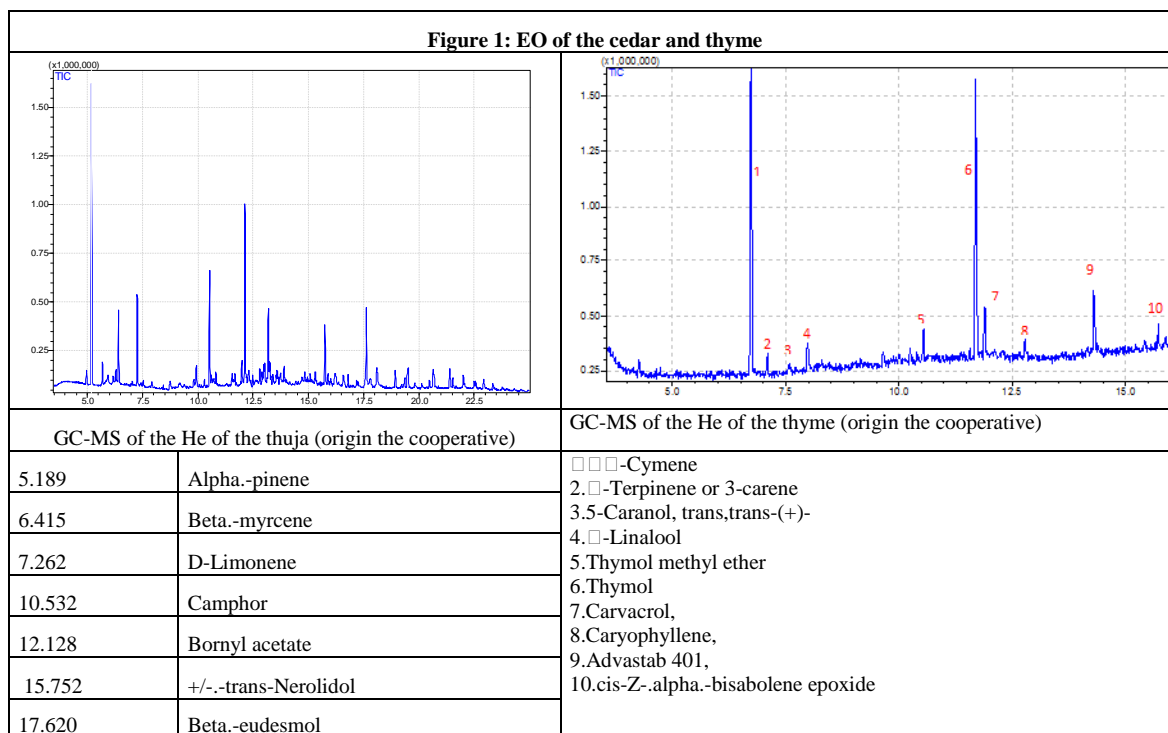
In this study, we present the results relating to aromatic and medicinal plants the more available and therefore exploitable. Thus, samples were collected in the rural commune Snada, near of Bniboufrah, located in the region of Al-Hoceima. Then two extractions of essential oils "HE" have been obtained by distillation (by drive to the water vapour). The 1st extraction was performed at laboratory with 100 g of raw material, and the 2th on the ground at the level of the workshop of the cooperative "Snada", thanks to a stainless steel alembic modern with a larger quantity of the order of 50 kg.

The determination of the chromatographic profile of essential oils obtained was made by *gas chromatography coupled with mass spectroscopy*.

Similarly, we have proceeded to the determination of the density, the acidity index, the index of peroxide, the index of refraction and the rotatory power of the oils that we have freshly extracted.

## RESULTS AND DISCUSSION

The results show that for a better yield in essential oils, it will be necessary to proceed to a good drying before the distillation. The drying having the aim of partially or totally eliminating the water to alleviate the product, and especially to get a better yield.



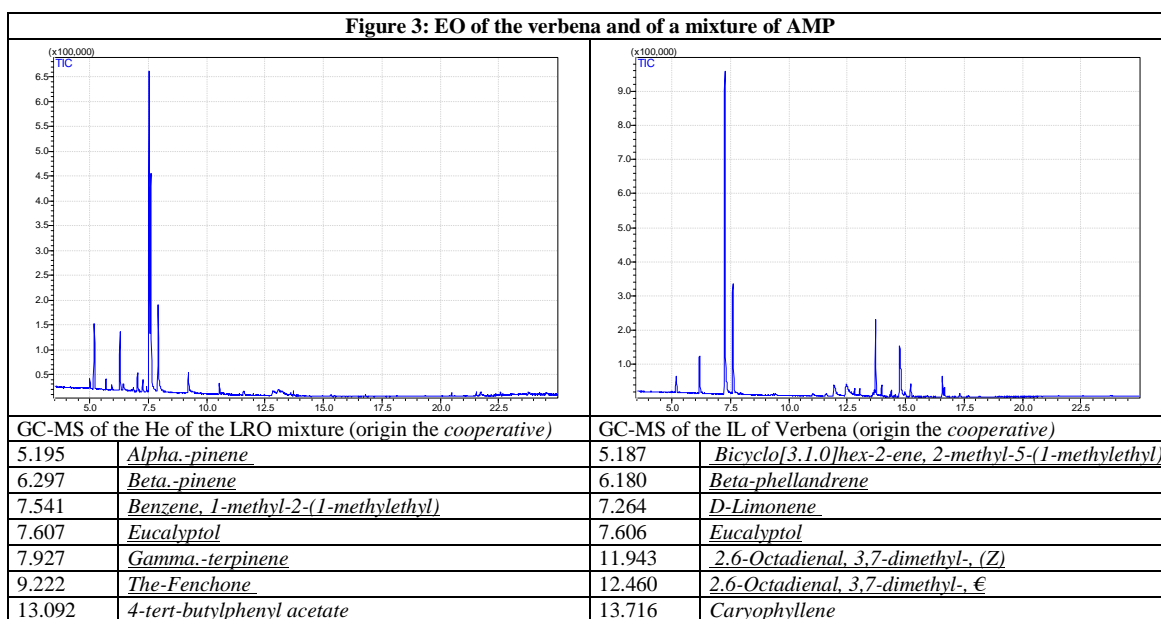
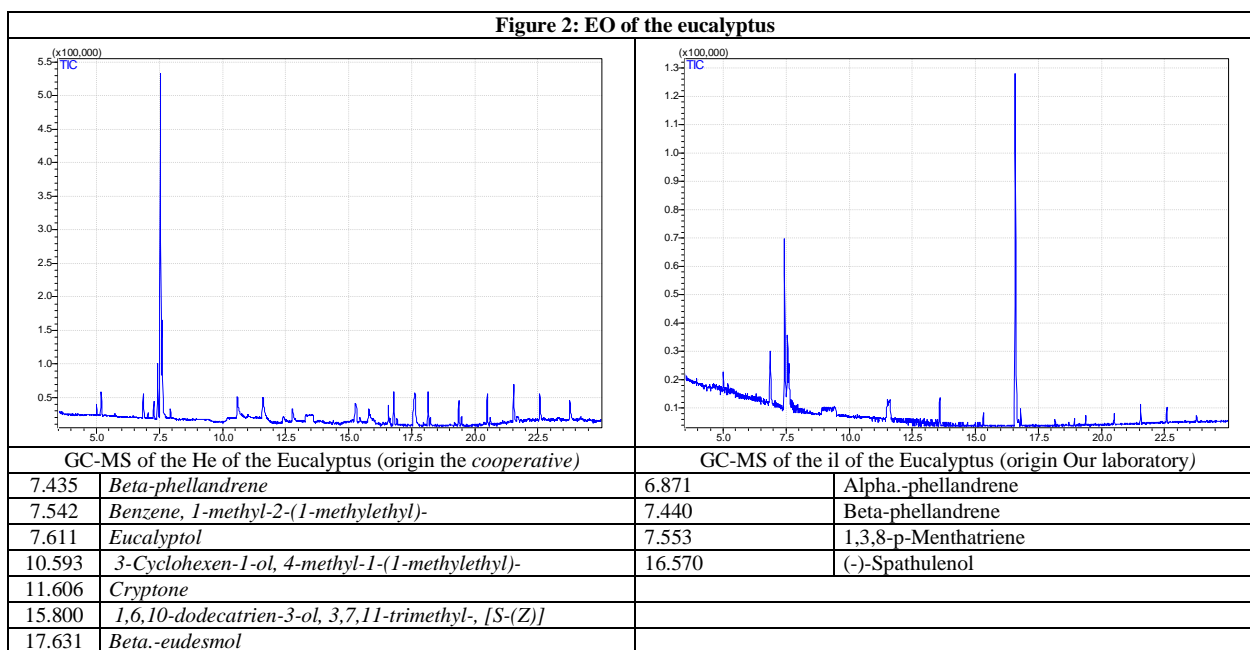
The temperature of the air is an essential factor in the drying process; as well 50°C is the maximum temperature not to exceed under penalty of damaging the aromatic and medicinal plants.

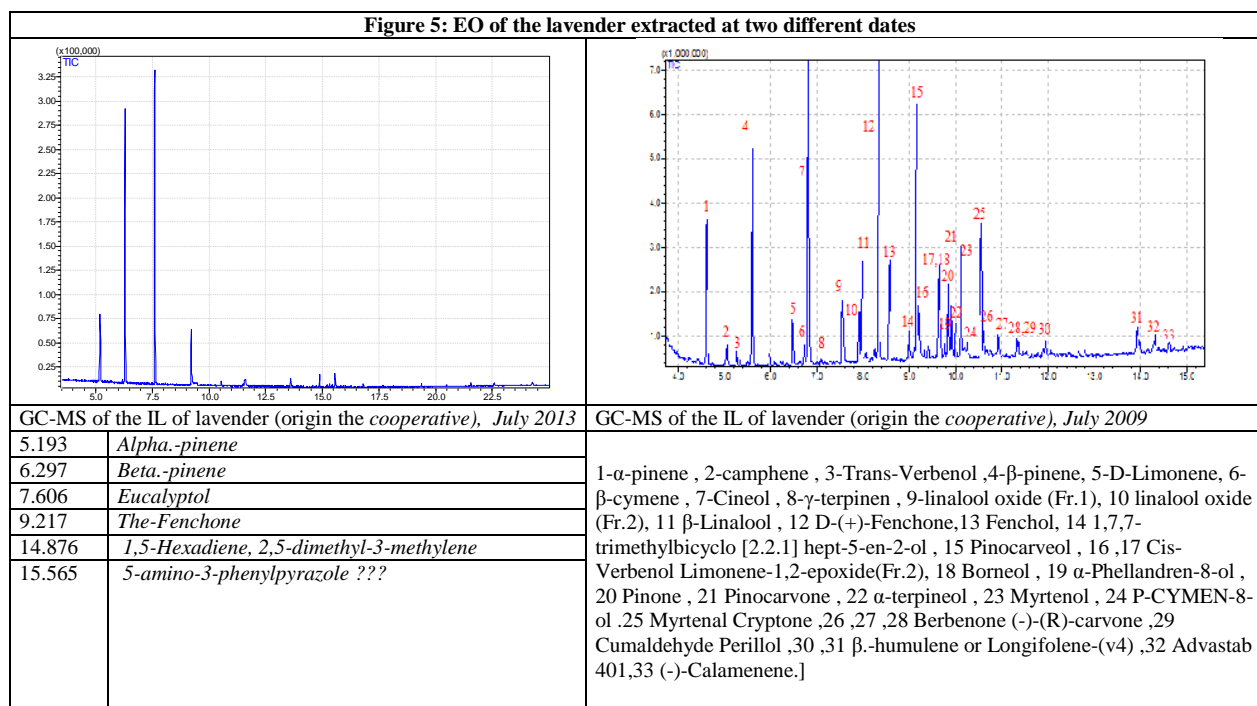
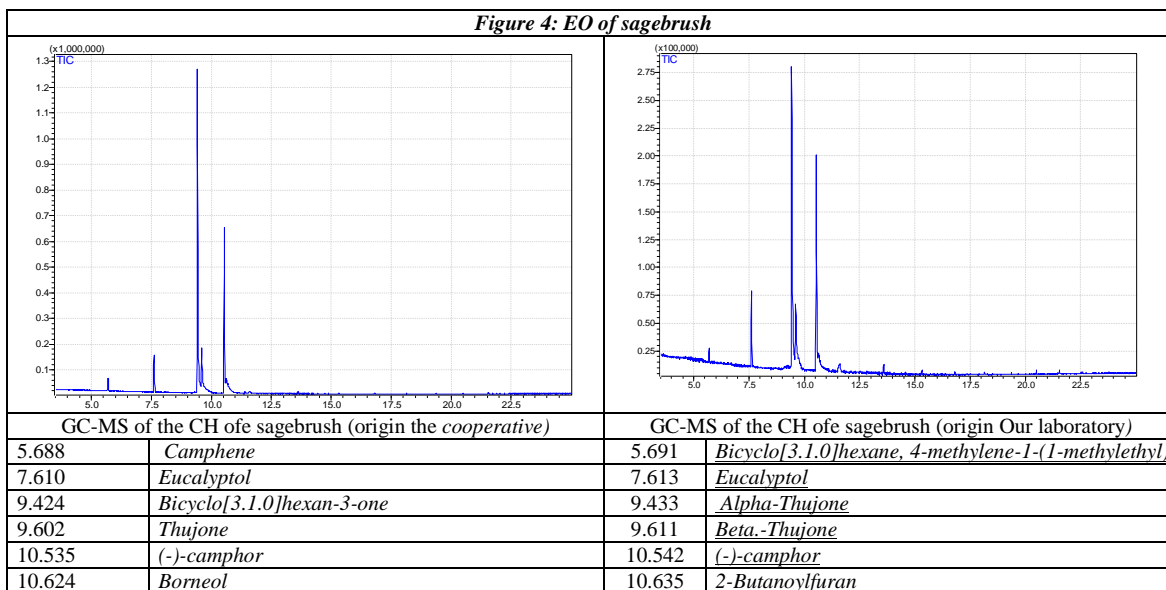
The yield and quality of essential oils remain variable according to several parameters: the exposure to the sun, the nature of the soil, the time of picking, the method of distillation and conservation,

In addition to the essential oils, one obtains the hydrolat aromatic (H.A): this is the distilled water (condensed water vapour), which is separated the essential oil at the output of the alembic. The H.A. contains aromatic substances water soluble (less than 5%, especially the alcohols and phenols).

The results obtained from figures 1 to 6, confirm that the essential oils, extracted from our plants, do not present a constant profile chromatographic. Therefore for a better characterization, we have to proceed to different analyzes of each lot, targeting use desired (perfume, ingredient of taste, hygiene products, beauty; soaps, cream....) [1].

The interpretation of different figures, remains arbitrary and uncertain, because each essential oil is almost unique, as a note of music, difficult to reproduce without a precis informatic support.

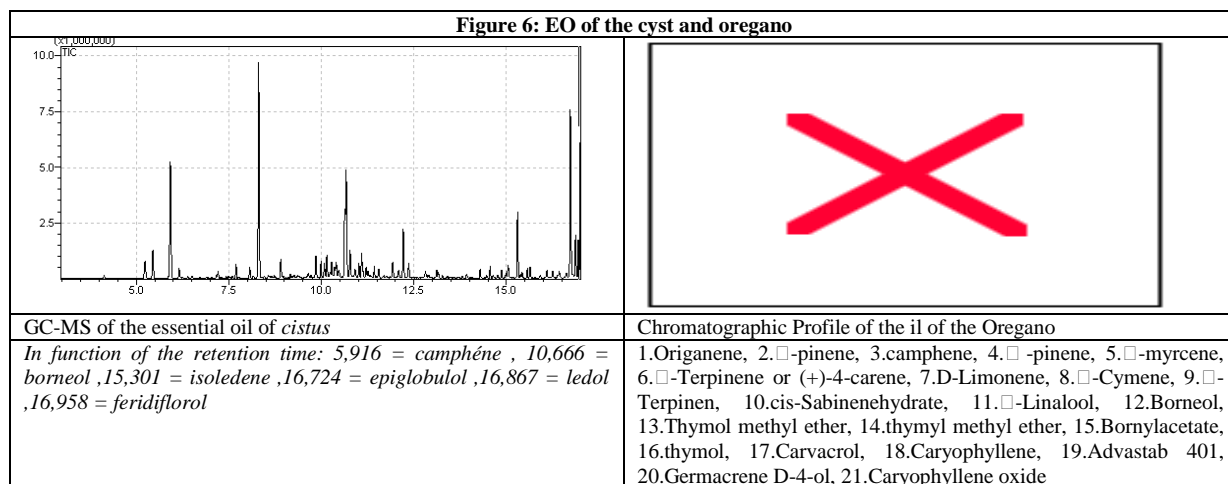




The aromatic and medicinal plants have assets indisputable, both preventive and curative, both by way of the skin, olfactory or infusion, but must be prescribed by experienced specialists to avoid all risk and abuse. Therefore, the use of essential oils must be very conservative, because according to the plant from which they are derived, they can be used like antibiotic, antiviral, antiseptic, fungicide, healing, digestive, anti-inflammatory, sedative.... For this, the treatments must be practiced under medical supervision.

The plant world is rich of more than 800.000 plant species of which only a part is capable of synthesizing the essences.

The aromatic molecules to the origin of the odour characteristic of the aromatic plant, are the more volatile and therefore the first to express themselves during the steam distillation of water. To extract the molecules more "heavy", essential to the therapeutic action, it is often necessary to distil the plant much longer and under a very low pressure. This good distillation process, taking place in an alembic in stainless metal, allows to obtain essential oils integrals, containing fractions of molecules called of "head", then of "tail". Thus, this method of distillation allows you to extract all of the molecules in the plant.



It should also be noted that the quality varies enormously from an oil to another, as well as the price, likewise that there are several varieties of essential oils. The appellation "Oil 100% natural" that are often found in the market covers a mixture of several natural essences, and the oil "100% pure and natural" comes from a single plant.

### CONCLUSION

In addition to the essential oils extracted, the floral water could also be valorised in different preparations, without neglecting the residues from the distillation which remain operable as fertilizer Bio for the fertilization of the soil, and also a possible methanogenic fermentation for the production of biogas [2, 3].

The results that we have just to get can be applied by several actors in the sector of essential oils (associations, local co-operatives, ...) and constitute a solid basis for cooperation synergistic between our research team and the various partners concerned and/or interested by the sector.

Our role can be to bring the added scientific value, and thus to strengthen the production capacity and the quality of the essential oils extracted by the various producers located in the circle of Bniboufrah (province of Al-Hoceima). As well, we can contribute to the valorization of aromatic and medicinal plants at the side of the efforts of the other actors, which would allow a sustainable development of the region of the rif. This region, which has suffered much from the exclusion because of its geographical feature difficult, despite the richness of its history and of its landscapes.

The main actor in all progress is the man, and we therefore rely on solidarity as universal value and human to assert any initiative of development in our region, without forgetting the protection and the preservation of our environment, thus our vision includes the human component, as well as its environment, because it is possible to valorize these natural resources for the benefit of citizens riparian, without prejudice to the biodiversity and the protection of the environment.

This study opens the prospects for development of the sector of medicinal and aromatic plants and proposes concrete projects in a position to contribute to the sustainable development of the region of Al-Hoceima.

The complementary efforts of the various stakeholders, each in its area of specialization, as well as the professional experiences gained, will allow for a better knowledge of the various aspects of the subject and understanding of the main gaming factors. This interactive and participatory context would result in an objective assessment and would lead to practical proposals, able to contribute to the development of the sector taking account of the specificities of the region.

At the level of the scientific research, our laboratories and teams of research of the University of Mohamed 1st, dispose of the know-how and the experience in the manufacturing, the analysis and the quality control of essential oils in view of the competitive export, this in passing by the identification and the determination of the ecology of the different species, the determination of the precise composition of the various extracts of different parts of the plant, the validation of the various traditional uses, the development of the different formulations for different articles (perfume, soaps, creams...).

What is lacking in the role of the university, it's the absence of local motivation for students trainees, the absence of certified laboratory, the need of a database with a regular update, the absence of private companies for the sponsorship, the training of young skilled in aromatherapy and adaptation with the texts of laws in force (legal framework).

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