



Research paper

Indigenous knowledge of the use of medicinal plants in the North-West of Morocco and their biological activities

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ABSTRACT

Introduction: This study is the first ethnopharmacological survey that investigates the traditional uses of medicinal plants in the province of Ouezzane (North-West of Morocco) as well as the indigenous knowledge related to the use of this natural resource in healthcare by the local population in order to preserve and protect this invaluable inheritance. We aimed also to reveal the *in vitro* pharmacological activities of some reported medicinal plants in this study.

Methods: In the survey, 113 informants (local inhabitants and herbalists) were interviewed using the semi-structured and unstructured methods and using a stratified sampling technique. Data collected were analyzed calculating three quantitative parameters: Use Value (UV), Fidelity Level (FL) and Informant Consensus Factor (ICF). Pharmacological properties of some reported medicinal plants were evaluated. The antioxidant activity was estimated by the DPPH radical scavenging assay and the antibacterial activity was evaluated using agar well diffusion assay and microtitration method.

Results: The results showed that 11% of the local population use traditional medicine, against 67% who use both traditional and modern medicine. The ethnomedicinal uses of 44 medicinal species representing 28 families were reported on. Lamiaceae were the most representative and include 32% of the identified species. The medicinal use revealed that leaves are the most used part of plants to prepare drugs, the decoction is the most widely used preparation method and remedies are often administered orally. The highest value of MUV was obtained for *Origanum compactum* Benth. (MUV = 0.62) and *Myrtus communis* L. (MUV = 0.52). In addition, the highest value of FL was recorded for *Origanum compactum* Benth. (100%), *Myrtus communis* L. (93.50%) and *Arbutus unedo* L. (93.50%). While, the highest value of ICF was mentioned for respiratory system diseases (ICF = 0.69), dermatocosmetology (ICF = 0.68), digestive system problems (ICF = 0.63) and nervous system disorders (ICF = 0.69). Plant extracts and essential oils showed important antibacterial properties against pathogenic strains and significant antioxidant capacities.

Conclusions: The ethnopharmacological data documented in this work revealed the use of medicinal plants in North-West of Morocco to fight against diseases. Therefore, efforts are needed for improving the level of the documentation, the conservation and standardisation of these species, and to preserve the transmission of traditional healing knowledge. Also, further studies testing other plant extracts in other pharmacological systems are needed to explore the scientific biological potential of these plants.

1. Introduction

Humans have always sought to use the plants in order to survive and to develop remedies to treat disease. The term ethnobotany was introduced by John Harshburger (an American botanist) in 1896. Although, the definition of this discipline has changed it now reflects the way in which people know the plants and their diversities in their localities as well as all the ancestral knowledge about them [1].

Medicinal plants are mostly used to prepare drugs used for the treatment against several diseases [2–4]. Moreover, ethnobotanical approaches reveal the importance of medicinal species within the local socio-cultural context. In fact, these studies may furthermore support the socioeconomic conditions of the region, preserve the indigenous knowledge of the local communities, and conserve its global heritage [5].

Medicinal plants are commonly used as remedies in developing countries. In Africa for example, more than 80% of the populations

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depend on traditional medicines for their medication [6,4]. Similarly, the African continent is rich in diverse of plant species, most of which are used as medicines. Indeed, among 300.000 plant species found on the planet, more than 200,000 species are found live in tropical Africa and have medicinal properties. Morocco is characterised by having a good geographical position which has allowed it to be a veritable area of plants diversity [7,8]. Morocco as a Mediterranean country has a long traditional medicine and knowledge of medicinal plants. Effectively, amongst 5000 species and subspecies listed in North Africa, 4200 species grow in Morocco, which at least 500 are potentially medicinal and 250 are already being used [9].

Herbal medicine is an important cultural tradition in Morocco [10] and plays a central role in the daily life of many rural and urban Moroccans [11–17]. Ethnopharmacological studies conducted across Morocco showed that studies for medicinal plants nationwide remain fragmented. Besides, the expertise is currently held only by few people [18,19]. The natural species in Morocco are currently experiencing a very intense and thorough degradation; because of the intensive exploitation of these species for medical needs. Indeed, almost all of the medicinal and aromatic species used in Morocco come from wild sources, medicinal plant cultivation remain relatively limited, thus, the exploitation of these species in Morocco is far from rational. Several studies conducted in various Moroccan areas revealed that the traditional applications of Moroccan medicinal plants [10,20–22,14,16,13] have scientifically studied the traditional pharmacopoeia in Morocco.

The ethnobotanical local knowledge from several regions of Morocco, particularly in the North, still remains poor [21,23]. This is the case for medicinal plant knowledge in the region of Ouezzane (North-West of Morocco). On the other hand, the understanding of the traditional local uses of plants may offer social, economical and public health implications in this region [23]. Indeed, the documentation of the extent of reliance on medicinal plants is very important because this traditional local knowledge of medicinal plants become in loss in developing countries like Morocco [17,24].

The province of Ouezzane (NW of Morocco) belongs to Tanger-Tetouan-Al Hoceima region of Morocco. It also belongs to the southern margins of the country Jbala whose great tribes are: Masmouda, Rhouna, Ghzaoua, Seta and Beni Mestara. It is surrounded by five other provinces: Larache, Kenitra, Sidi Kacem, Taounate and Chefchaouen (Fig. 1).

According to High Commission for Planning (2014), Kingdom of Morocco, The province of Ouezzane possesses an area of 2 km², a density of 140.4 in./km² and a population of 300.637 censuses. The economy of this province is mainly depending on natural resources,

especially the pastoral activity and arboriculture (e.g., Carob tree, Oliver and Fig tree). While, marketing of other natural resources like medicinal plants take secondary place in the local economy [25–27].

Furthermore, the province of Ouezzane (North-West of Morocco) has a particular climate with ecological zones and topographical regions that offer a good diversity of vegetation such as aromatic and medicinal species [25–27]. Moreover, different conditions have seriously depleted the indigenous knowledge of the local population of Ouezzane province such as deforestation, famines, and ignorance in the past regarding ethnobotanical documentation. There is not much data about traditional plants of the North-West of Morocco and some studies carried out by our team have started to evaluate the pharmacological properties of some medicinal plants [28–31].

This is the first ethnopharmacological survey that has been conducted for documenting and analyzing the traditional medicine in the Ouezzane province. This study was aimed to document the traditional use of North-West Moroccan medicinal plants and its associated knowledge. For analyzing the data and exploring significant findings, statistical parameters were used such as ICF, FL and MUV. Finally, *in vitro* antioxidant and antibacterial properties of some selected plant extracts and essential oils were evaluated.

2. Methods

2.1. Study area

The province of Ouezzane is a region that lies in the North-West of Morocco, in the pre-Rif, south of Wadi Loukkous. It is one of the biggest provinces of the Moroccan Tanger-Tetouan region. This area is located at 34°47'50" N and 5°34'56" W. The studied areas of Ouezzane province are characterized by having a high relief, acting as a constraint for its development. The climate is of Mediterranean type, particularly sub-humid according to the classification of EMBERGER. It is characterized by a dry summer with temperatures ranging between 19 °C and 32 °C and a cold winter with mild temperatures between 6 °C and 14 °C. The humidity index shows an annual average of 800 mm, unevenly distributed. Soils are different depending on the areas. In addition, soil erosion has increased due to man's activities, i.e. overgrazing and clearing the forests. Agriculture is considered as the principal economic sector in this province and their products constitute the main source of life for the population. These products are essentially based on the cereal-based subsistence farming, the livestock and the arboriculture, mainly olive (*Olea europaea* L.) and fig trees (*Ficus carica* L.).

The province of Ouezzane is characterized by a diversity of plant

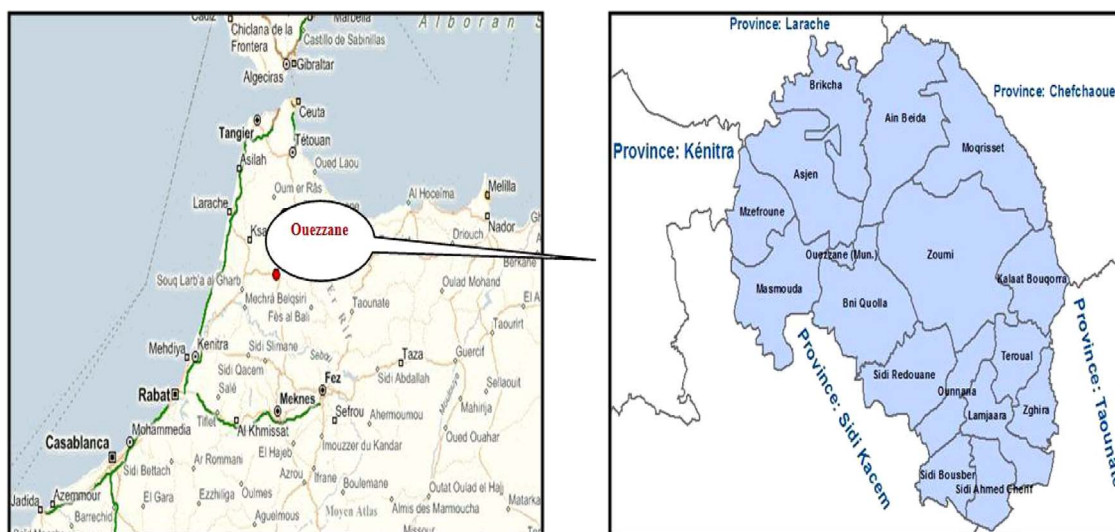


Fig. 1. Province of Ouezzane (North-West of Morocco).

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