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Research Article

Medicinal Investigation and Ethnopharmacological Applications of *Erica arborea* L. in the Nefza and Tabarka Regions, Northwestern Tunisia

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Abstract

Background and objectives : Ethnopharmacology is a scientific discipline that concentrates on the traditional use of medicinal plants and natural remedies with the aim of discovering new pharmacological bioactive phytomolecules. In this context, we aimed on the valorization of the tree heather (*Erica arborea* L.) in northwestern Tunisia.

Methodology : An ethnopharmacological investigation was conducted among rural communities and herbalists in Nefza and Tabarka regions. The survey was based on a questionnaire focused on the use of *Erica arborea* in alternative medicine. After field data collection, it was processed and analyzed using Excel software, allowing the creation of graphic representations.

Results : The obtained results showed that the *Erica arborea* species is widely used in the regions of Tabarka and Nefza. It is particularly appreciated for the treatment of multiple pathologies, particularly that of the gastrointestinal system (43%). Importantly, the results also showed that the population in question used the different parts of the plant in its mature state for the treatment of flu (15%), diabetes (13%), respiratory and cardiovascular diseases (13%), stress-related disorders (10%), as well as a hormonal stimulation (4%). Additionally, we demonstrated that most of the respondents used the aerial parts, particularly the leaves and flowers, in the form of decoction, infusion and maceration.

Conclusion : Thus, the present ethnopharmacological study is interesting insofar as it allows us to guide us in targeting the pharmacological activities and therapeutic potential of *Erica arborea*. It highlights the intergenerational continuity in the transmission of knowledge related to the traditional uses and benefits of tree heather.

Keywords: *Erica arborea*; Ethnopharmacology; Traditional Preparation; Medicinal Applications; Northwestern Tunisia

Introduction

Ethnopharmacology is the scientific study of the interactions between human knowledge, natural phytocompounds, and the biological activities associated with their use. This approach has been shown to combine aspects of ethnology, botany, chemistry, pharmacology, and medicine to study how traditional cultures use plants to cure or alleviate illnesses [1].

The Mediterranean region is home to a great diversity of plant resources. It includes about 22,500 vascular plant species [2], of which nearly 11,700 are present in the «hotspot region», including Tunisia [3]. This high density has led to a growing interest among researchers in plant biodiversity. Indeed, about 70% of wild plants in this region have potential for use as ornamentals, medicinal plants or for biotechnological applications [4].

In the same respect, out of a total of 2163 plants species recorded nationally, Tunisia is home to more than 500 species of aromatic and medicinal plants. A large part of this flora flourishes in difficult environments, particularly in the arid and semi-arid areas of the country [5].

Among these remarkable species, the tree heather (*Erica arborea* L.) is characterized by a wide African-Mediterranean distribution. It was considered the only species of its genus that grows spontaneously in both Europe and Africa. This particularity gives it a discontinuous geographical distribution. It is found in North Africa, notably in Tunisia, Morocco, and Algeria, but also on the Atlantic coast of Spain, in the Pyrenees, in the Middle East, as well as in more distant regions such as Australia, South Africa, western Portugal and the Canary Islands [6-9].

Interestingly, beyond its ecological importance, this species is widely recognized for its traditional and artisanal uses. Its wood is particularly prized for the production of high-quality charcoal, while its roots are used in the manufacture of renowned pipes. Since the Middle Ages, *Erica arborea* has also occupied an important place in traditional medicine, due to its numerous therapeutic properties such as antiseptic, sedative, anti-inflammatory and antiputrid activities [10,11].

Importantly, it was traditionally used to prevent heart disease [12], treat urinary system disorders [13], as well as wounds and snake bites [9,14]. On the other hand, bioactive substances isolated from the plant exhibit many biological activities such as antiulcer, antimicrobial and antidiarrheal actions [9,15].

However, an ethnopharmacological survey concerning the traditional and medicinal use of tree heather, describing the parts used and the methods of use of the plant in traditional medicine, was carried out in Nefza and Tabarka regions.

Materials and Methods

Choice of regions

We selected certain areas in Northwestern of Tunisia, notably the regions of Tabarka (Jendouba Governorate) and Nefza (Béja Governorate), due to their abundance of *Erica arborea* L. (Figure 1). The questionnaires were conducted between February and mid-April 2025.

Figure 1: *Erica arborea* (own take).

Questionnaire development

A survey form was prepared, including two categories of questions for volunteers: the first concerned the identification and personal information of the individual being surveyed (last name, first name, age, occupation), and the second concerned the identification and use of the plant (diseases treated, harvest stage, preparation, administration method,...). A comments section was included at the end of the questionnaire, allowing the respondent to provide additional information regarding the use of the plant.

Working methodology

Firstly, we developed 100 copies of the questionnaire, focusing on the urban population, farmers, practitioners, herbalists, and forestry officials to ensure the reliability of the data collected. The presentation began with an introduction of our identity via a professional badge, followed by a brief explanation of the importance of their knowledge, traditional medicine, and the subject of our study. The survey was conducted at their workplaces or even at their homes. Each individual was interviewed separately, and the questions were simply worded to ensure they were understandable and we could obtain meaningful responses.

During the interview, each response was evaluated, and the interviewee took the time to provide an answer. Usually, even if the person opposite us offered unnecessary information, we listened attentively and rephrased the questions if necessary.

Data analysis

The data recorded on the survey forms were then processed and entered into Excel. Quantitative variables are described using frequency of responses. Qualitative variables are described using frequency of responses.

Results

Sociodemographic study of the surveyed population

Distribution of respondents by age

Data analysis revealed that the median age was between 25 and 45 years, representing approximately 35% of the sample, followed by those aged 45 to 65 years (30%) and those under 25 years (approximately 20%). However, informants over 65 years constituted the least represented group, with approximately 15% (Figure 2).

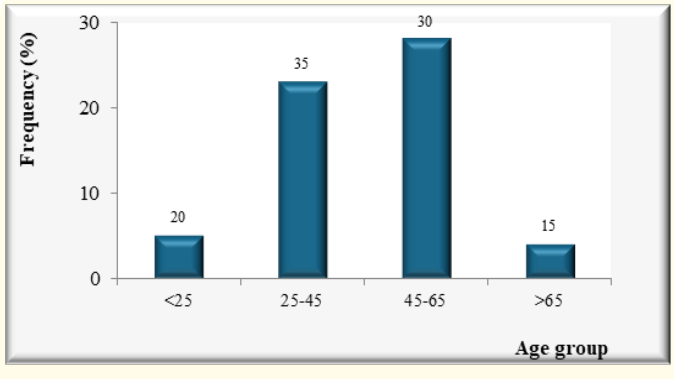

Figure 2: Distribution of respondents by age group.

Distribution of respondents by gender

The results in figure 3 showed that the majority of those surveyed in this study are women (58%), compared to men (42%).

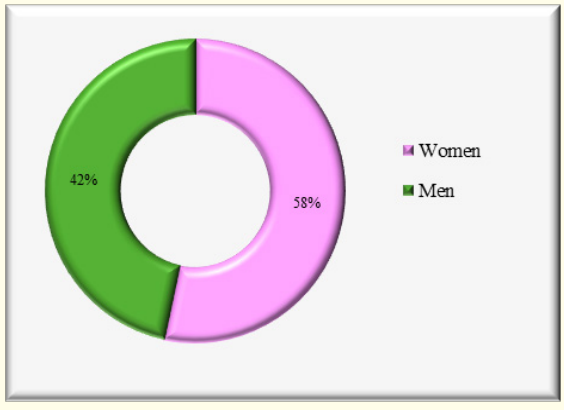

Figure 3: Distribution of respondents by sex.

By educational level

Regarding educational level, 47% of participants had a university education, followed by secondary education with a percentage of 25%. Those with a primary education and illiterate people were the least represented (Figure 4).

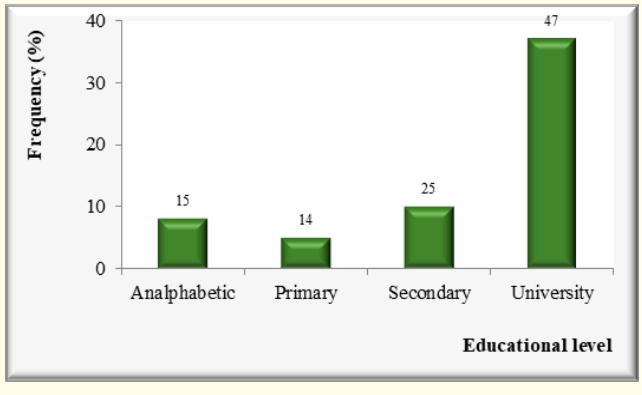

Figure 4: Distribution of respondents by educational level.

Ethnopharmacological data of tree heather

Depending on the parts of the plant used

The established survey showed that the leaves and flowers are the most used with rates with rates close to 28%, then the whole plant is at 24%, while the stem and roots presented a level of 20% (Figure 5).

According to the harvesting stage

According to the interviewed population, the leaves part were used in their mature (40%), immature (33%) states, or indifferently (Figure 6).

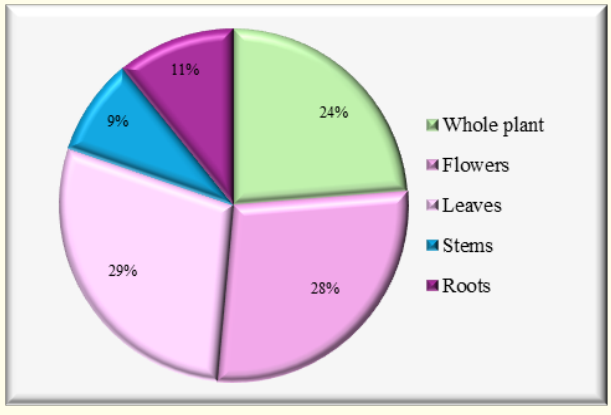

Figure 5: Frequency of use of different tree heather parts.

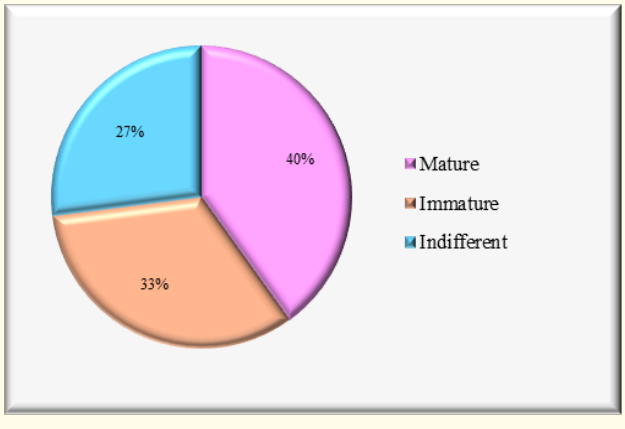

Figure 6: Harvesting stage of *Erica arborea.*

Depending on the preparation method

According to the respondents, we noted a lack of precision for several plant species, particularly regarding the quantity of parts used, the type of solvent or support, the time required for preparation (decoction, infusion, maceration, poultice), as well as the exact dosage to be followed. Despite this, certain preparation methods remain predominantly used (Figure 7), namely decoction (49%), infusion (33%) and maceration (14%).

Administration modes

According to residents of Nefza Tabarka regions, heather extracts are primarily consumed orally (66%). Additionally, poultices are used locally to treat wounds, sores, snake bites, and certain skin conditions (20%). Furthermore, some residents use heather roots to make pipes (14%) (Figure 8).

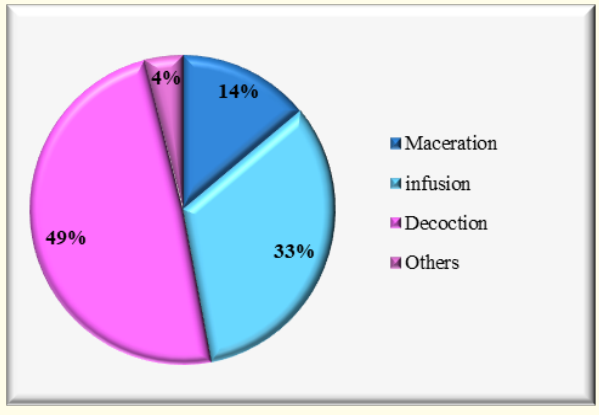

Figure 7: Frequencies of *Erica arborea* preparation modes.

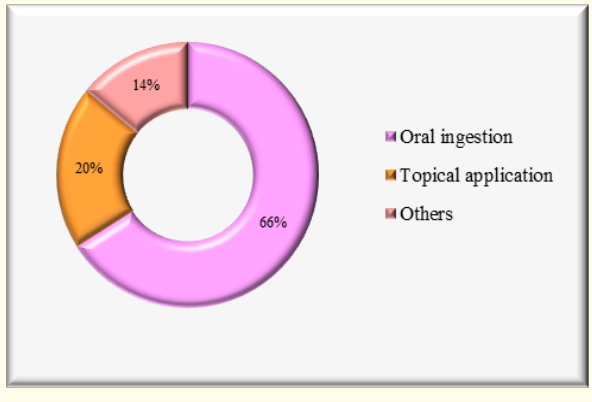

Figure 8: Frequency of administration.

Traditional and medicinal applications of *Erica arborea*

Importantly, 43% respondents use *Erica arborea* to treat digestive tract conditions (bloating, constipation, indigestion). This is followed by applications for the treatment of flu and sore throats (15%), as well as respiratory and cardiovascular conditions (13%). Additionally, 13% of respondents reported its use in the treatment of diabetes.

Other secondary uses were also noted. Indeed, 10% of the population use it as a natural sedative, while 4% noticed its role as a hormonal stimulation, and 3% use it to treat hepatorenal disorders (Figure 9).

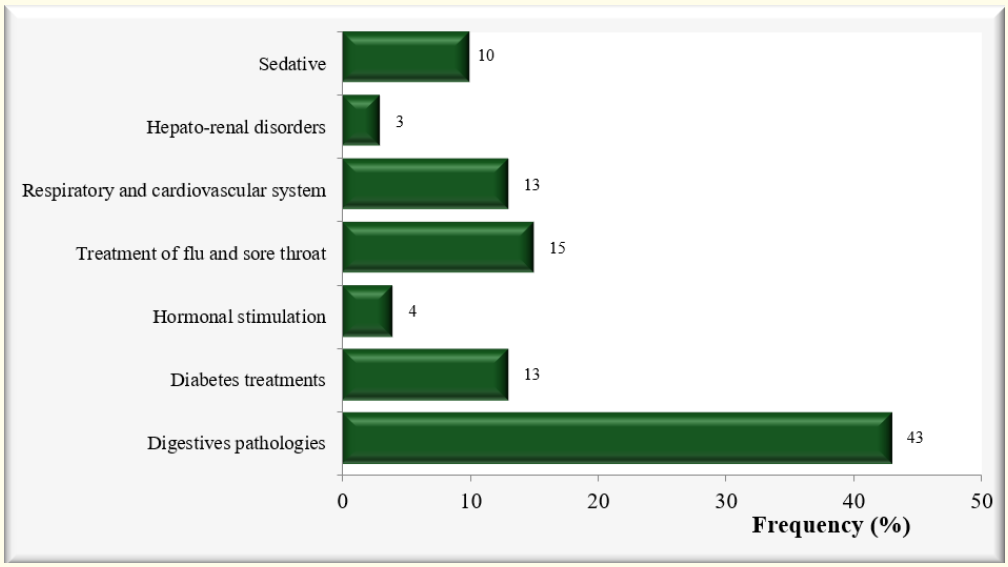

Figure 9: Frequency of different traditional and medical uses of *Erica arborea*.

According to the satisfaction rate of respondents

Figure 10 demonstrated a positive trend showing that the vast majority of respondents were satisfied or very satisfied with the results of the prescriptions (72%). However, only a small proportion expressed a moderate level of satisfaction (27%), and virtually no one was disappointed (1%). This suggests high overall effectiveness of the prescriptions according to the respondents.

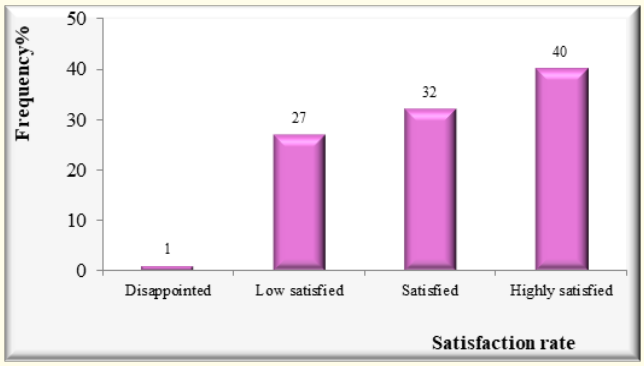

Figure 10: Frequency of inventories satisfaction levels of *Erica arborea* use.

Discussion

Ethnopharmacological research is considered as a combination of both traditional and conventional medicine [16]. In this context, many previous studies have evaluated the benefits of medicinal plants traditionally used in the treatment of certain pathologies [17-19].

The field survey in the Nefza and Tabarka regions showed that knowledge of the beneficial effects the tree heather, its methods of preparation and use, as well as its properties are the result of experiences acquired over generations. However, older people, who should provide more reliable data due to their possession of a large part of ancestral knowledge, are beginning to disappear. It should be noted that expertise has expanded to a younger age group, and this achievement is more remarkable especially among herbalists [20].

On the other hand, the use of treatment with the plant in question varies according to gender. Women have a better use and knowledge of medicinal plants. In fact, this type of data regar-

ding the gender of the interviewees has also been demonstrated by other researchers [11,21,22]. Although often illiterate in rural areas, women play a key role in traditional medicine. In addition, by transmitting this knowledge, they demonstrate a deeply rooted knowledge adapted to the specific needs of their family. However, this trend is confirmed by several studies carried out in Tunisia, Algeria and Morocco [17,23,24].

As for the level of education, the attraction to medicinal plants is mainly manifested among individuals with a secondary or higher level of education. This category of people who are interested in have essentially acquired their knowledge through oral transmission from their ancestors and their family. However, these conclusions have also been reported in other works of literature [25,28].

According to the survey results, we recorded that most of the respondents used the leaves and flowers. The high frequency of use of aerial parts could be related to the fact that these are provided with abundant quantities of secondary metabolites [27].

The obtained results showed a marked preference of the local population for the decoction, perceived as effective for warming the body and disinfecting the plant [28]. In addition, the decoction would promote the extraction of a greater number of active ingredients and would contribute to reducing, or even eliminating, the toxicity of certain preparations [24].

More importantly, our findings demonstrated that the medicinal use of *Erica arborea* remains relatively limited and undervalued in traditional pharmacopoeia, although the plant is well represented in the forested areas of the Northwest. The obtained results also demonstrated other beneficial effects such as diuretic, depurative, and anti-inflammatory properties, as well as in the treatment of urinary tract and digestive disorders, as well as for relieving certain joint and respiratory pains. On the other hand, we noticed a diversification of the traditional therapeutic uses of *Erica arborea*. They also demonstrate extensive empirical knowledge on the part of local populations, who exploit the virtues of this plant despite the absence of local scientific studies on its efficacy and safety.

According to the literature, in Italy, an ethnobotanical survey has shown the diuretic effect following the consumption of tree heather in the form of infusions and decoctions [29]. In North African countries, researchers have revealed the beneficial effect of the plant in the treatment of kidney stones [30]. In traditional Turkish medicine, the flowering ends are prepared in infusion or decoction for their diuretic and antiseptic properties [31,32]. Furthermore, a study conducted in the Canary Islands has suggested the potential of heather in the treatment of urinary tract infections, inflammations, hypertension and insect bites [33]. In Algeria, traditional therapists use the flowers to treat various kidney ailments as well as prostate disorders [34]. Known for its astringent power, Erica arborea is used in many folk medicinal practices for its anti-ulcer, anti-edematous, antidiarrheal, and wound healing properties [9]. On the other hand, previous ethnopharmacological studies have confirmed several beneficial effects of this plant, including its antioxidant and laxative powers [35].

Conclusion

This investigation highlight the importance of targeted regional studies to better understand local uses and guide more appropriate phytochemical and pharmacological research. Thus, the therapeutic use of this species could be more effectively promoted, from the perspective of integrative traditional medicine or the development of local natural products. Furthermore, analysis of the results obtained regarding the relationships between tree heather (*Erica arborea* L.) and the types of pathologies treated revealed that the methods of administration and preparation are highly dependent on the disease being treated.

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Conflict of Interest Statement

Authors declare that there are no competing interests.

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