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Original Research Article

Ethnobotanical Survey of *Chamaerops humilis* L. in the Rural Commune of Sidi Youssef Ben Ahmed, Sefrou Province, Morocco

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ABSTRACT

Chamaerops humilis L. is one of the numerous medicinal herbs which provides beneficial properties and is used in folk medicine to treat different ailments in the rural commune of Sidi Youssef Ben Ahmed province of Sefrou, Morocco. The current study was conducted to carry out an ethnobotanical survey of the uses of *Chamaerops humilis* L. in the commune of Sidi Youssef Ben Ahmed province of Sefrou in Morocco. A total of 100 respondents were interviewed using a structured questionnaire to determine the uses, used parts, domain, therapeutic indications, and maturation period of *C. humilis* L. The results obtained indicated that the study plant was frequently used by respondents over 60 years old (44%). Married women who did not have any form of education were the most predominant users. Parts of the study plant used by the respondents were the leaves (45%), fruits (34%), pulp (21), mainly prepared by decoction (61%) method, which contributes to an effective treatment agent for diabetes, digestive disorders, and urinary tract infections. The finding of this study has provided scientific justification for the use of *Chamaerops humilis* L. by the rural commune of Sidi Youssef Ben Ahmed province of Sefrou, Morocco.

Keywords: *Chamaerops humilis* L., Ethnobotanical study, Sidi Youssef Ben Ahmed, Survey.

Introduction

For centuries, our ancestors used plants to relieve their pain, heal their ailments and wounds. The uses of medicinal herbs were transmitted from generation to generation. Medicinal plants are considered a good source of multiple functional substances, which are used in folk therapy and can be harnessed for conventional drug discovery.[1] Recently, medicinal herbs have been proven to have different therapeutic properties such as antidiabetic,[2,3] diuretic,[4] anti-inflammatory,[5–7] neuropathic pain relief,[8] and anticancer effects.[9]
The geographical location of Morocco provides it a great condition to enhance the development of different medicinal herbs.[10] *Chamaerops humilis* L. species (*Doum* in Arabic and *Iyzedam* in Tamazight) are one of the numerous medicinal plants located in Morocco. The plant is known for its oviform fruits, reddish-brown, and appears in various sizes (10 to 20 mm). Their pulp is very fibrous, slightly sweet, and very astringent (Leghaz in Arabic and Aghaz in Tamazight). The period of morphological and physiological maturity of the fruit ranges between September and October. The pulp of the plant is cylindrical, tender, and off-white in color (Jemmar or Jmmakh in Arabic and Iynade in Tamazight) with a sweet flavor similar to that of artichoke. *Chamaerops humilis* L. belongs to a taxon of high ethno-pharmaceutical value.[11] Traditionally, it is used to treat digestive disorders, spasms, and diabetes.[12] In addition to its health benefit, it plays a crucial role in ecosystem stability.[13]
The current research was an ethnobotanical survey of *Chamaerops humilis* L. used by the rural commune of Sidi Youssef Ben Ahmed, province of Sefrou, Morocco.

Materials and Methods

Description of the study area
An ethnobotanical survey of traditional uses of *Chamaerops humilis* L. was carried out in the rural commune of Sidi Youssef Ben Ahmed province of Sefrou, Fez-Meknes region (33°49'53" N; 4°48'11" W). The study area has a total population of 286,489 people. Due to its geographical position and climatic factors, it offers great ecological and floristic diversities. According to the monograph of the province of Sefrou, the region's climate is semi-arid and characterized by a cold winter with irregular rainfall, hot, and dry summer. The average annual rainfall is 642 mm and the average annual temperature is 15.9°C.[14]
This study focused on the rural commune of Sidi Youssef Ben Ahmed which is a part of the province of Sefrou, Morocco. The commune has a total population of 12,362 inhabitants (2014) and covers an area of approximately 224 km^2. It is limited to the North by the Aghbalo Akourar commune; to the South by the rural Laanoussar commune; to the East by the Azzaba commune, and the inhabitants of Sidi Lahcen as well as the municipality of Tazouta. In the West, it is limited by the Kandar Sidi Khiar and Sefrou communes (Figure 1).

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Figure 1: Geographical location of the study area (*: Study site)

The bio-climate of the Mediterranean continental is characterized by humidity and cold in the winter, and heat as well as drought in the summer. The station is rainy during the first three months of the year (January, February, and March) with an average precipitation of 500 mm, a maximum average temperature of 29°C, and a minimum of 11°C. This area is characterized by the dominance of mountains, a diversity of important plant species, mainly carob, eucalyptus, Doum (*Chamaerops humilis*), Azir (*Rosmarinus officinalis*), and Zaatar (*Thymus vulgaris*).[15]

Study method

The ethnobotanical study was carried out on one hand, according to a simple and random sampling method, and on the other hand, using investigation sheets. A total of 100 subjects were recruited for the study. During each interview, information on the age, sex, educational level, residence, and familial situation of the respondent, as well as the medicinal uses of *Chamaerops humilis* L., preparation method, and most used part of the plant were collected. The interviews were carried out according to the Wentholt method,[16] which consists of using the local language, interviewing women and men separately. The information obtained was recorded first on data sheets and then transferred to a database, processed by Sphinx V5 software which allows both quantitative and qualitative analysis.

Results and Discussion

Socio-demographic profile of the respondents

An ethnobotanical investigation was carried out in the rural commune of Sidi Youssef Ben Ahmed province of Sefrou, Morocco, which was chosen for its floristic, ecological, and climatic diversity. Also, the great knowledge of its population in traditional phytotherapy was considered for the study. Figure 2a shows the results of the uses of the study plant, *Chamaerops humilis* L. according to the age of the respondents in the Sidi Youssef region. The oldest population surveyed represents 44% of the respondents, while the other age ranges from 40 - 60, 20 – 40, and <20 years which represent 31, 18, and 7% respectively. It clearly shows that *Chamaerops humilis* L. is predominantly used by the oldest population of the Sidi Youssef region. The traditional uses of medicinal herbs are generally acquired following a long-accumulated experience. The results of this survey have effectively shown that older people have more knowledge about the uses of the study medicinal plant compared to the other age range. This observation is in agreement with the finding reported by Zerkani *et al*.[17]

Age and educational levels

Out of a total of 100 respondents interviewed in the Sidi Youssef region, 56% were women and 44% were men, with an age range of <20 - > 60. Of these, it was observed that the levels of education of the respondents vary from uneducated (52%), primary (30%), secondary (14%), and tertiary (4%). Furthermore, 51% of the respondents were married, 47% were single, and 2% were divorced (Figure 2b-d).

Uses of Chamaerops humilis L.

The uses of *C. humilis* L. reported by the population of Sidi Youssef (Figure 3) revealed that therapeutic use of the plant represents 45%, while its use as cattle feed accounted for the lowest proportion (7%). However, the population of the studied region uses *Chamaerops humilis* L. for household applications. Previously, Moussa *et al*,[18] reported that the *Chamaerops humilis* L. is used for local crafts and the foliage is used to make mats, ropes, baskets, and hats.

Parts of Chamaerops humilis L. used

Figure 4 depicts the proportion of the part of the study plant used for medicinal purposes. With regards to the availability of *Chamaerops humilis* L. in the Sidi Youssef region, analysis of the data collected indicated that the different parts of the plant were used. Forty-five (45) percent of the respondents used the leafy part of *Chamaerops humilis* L., while the fruit and pulp were used by 34 and 21% respectively. The high frequency of the leaves used could be due to their availability and ease of harvest.[19] Furthermore, leaves contain different bioactive compounds that provide therapeutic effects.[20]

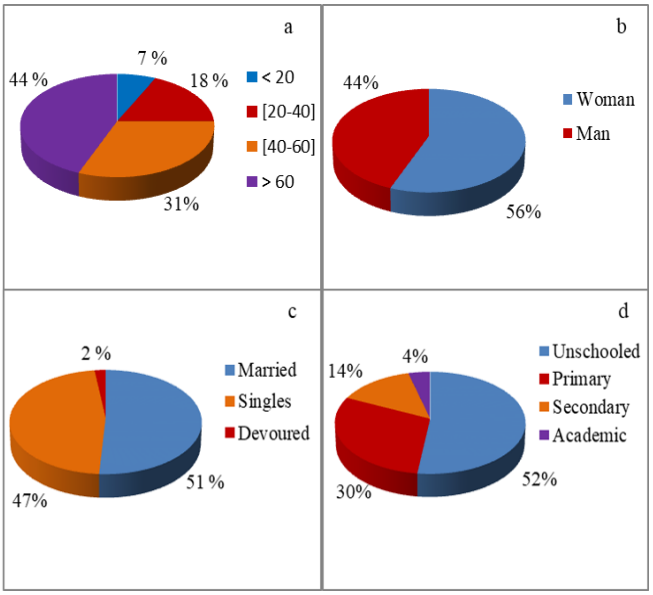

Figure 2: Distribution of users of *Chamaerops humilis*. L according to age **(a)**, Sex **(b)**, familial relationship **(c)**, and level of education **(d)**

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Domain of Chamaerops humilis L. uses

In this study, 55% of the respondents declared that they used the study plant in therapeutic domain to treat different ailments. The beneficial effect of aqueous extract of *Chamaerops humilis* L. leaves was proved and used in Moroccan traditional medicine.[12] Meanwhile, 27% of the respondents used the leaves to prepare ropes and handcrafted items for sale in the markets which served as a source of their incomes.[21] Also, 18% of the surveyed people used leaves of the study plant as forage (Figure 5). On the other hand, the fruits of *Chamaerops humilis* L. contain different substances which have strong biological activities. Traditionally, fruits are used by 50% of the respondents to treat several diseases. Other uses accounted for 30, 18, and 2% for food, tanning, and commercial activities, respectively. Fruits are useful as an astringent due to their tannin content.

Several studies reported the culinary uses of the fruits in rural zones due to their high nutritional value.[22–24] The pulp of *C. humilis* L. is widely used in traditional medicine by the population of the Sidi Youssef region. The data obtained revealed that 53% of the respondents used the pulp as a natural product to cure numerous ailments, while 30% of those surveyed preferred to use it as a nutritional food. In addition, 17% of the respondents considered the pulp of *C. humilis* L. as a good marketable product due to its nutritional properties. The beneficial properties of the pulp of *C. humilis* L. were documented previously by Salhi *et al*.[19]

Therapeutic indications of different parts of Chamaerops humilis L.

The medical uses of the different parts of *Chamaerops humilis* L were investigated and results indicated that the predominant ailments treated with the plant were diabetes (67%) and respiratory system infections (18%). In the literature, the anti-diabetic activity of *Chamaerops humilis* L. was examined by several studies and its salutary effect that could be due to its functional ingredients was proven.[13,24,25] Analysis of the leaves of the study plant confirmed its hypoglycemic effect and ameliorative respiratory tract disorders.[26,27] On the other hand, fruits of the study plant, were used to treat digestive disorders by 55% of the respondents as presented in Figure 6. The observation is in agreement with the finding reported by Medjati.[25] Furthermore, fruits were used to treat urinary system diseases by 33% of the respondents while 12% applied fruits in the treatment of diabetes. Scientifically, beneficial properties of fruits of *C. humilis* L. were reported as having a diuretic effect,[13] and anti-diabetic properties.[28] It was observed that 50% of the respondents used the pulp of the study plant as a hypoglycemic agent, 38% of the respondents used it to relieve gastric disorders, and 12% of the respondents used it to treat other diseases (Figures 6 and Table 1). These observations are in line with the findings by Medjati,[25] and Hasnaoui *et al*.[13]

Distribution of Chamaerops humilis L. *preparation methods*

The results obtained for the distribution of preparation methods (Figure 7) indicated that decoction of leaves of the study plant was the most used method by the respondents, which accounted for 61%, while the infusion method was used only by 39% of the respondents. This observation is in support of the previous report.[29] The facility and feasibility of extract preparation by decoction in households are the main reasons for the popularity of this method. In contrast, storage of prepared extracts is not feasible for a long period in the absence of adequate storage conditions which may induce intoxications. However, fruits of *C. humilis* L. were used for mastication, grinding, and decoction with 54, 36, and 10% respectively. Concerning the pulp of *C. humilis* L., the population used it as an ingredient to prepare salad (66%) and for chewing (34%) as revealed by the respondents. This observation is consistent with a previous study by Medjati.[25]

Maturation period of the fruits and pulp of Chamaerops humilis L.

The period of maturation of the fruits and pulp of *C. humilis* L. varies according to the respondents (Figure 8). It was revealed that 62% of the people interviewed harvested the fruits of the study medicinal plant during autumn, while 30% of the respondents harvested the fruits during summer. Billem,[32] indicated that the morphological and physiological maturity of the fruits takes place at the end of August, September or even October. Concerning the pulp, 69% of those who participated in the survey harvested it in the spring season, while others claimed that the harvest was done in the seasons of autumn, summer, and winter, with respondent values of 18, 6, 7% respectively.

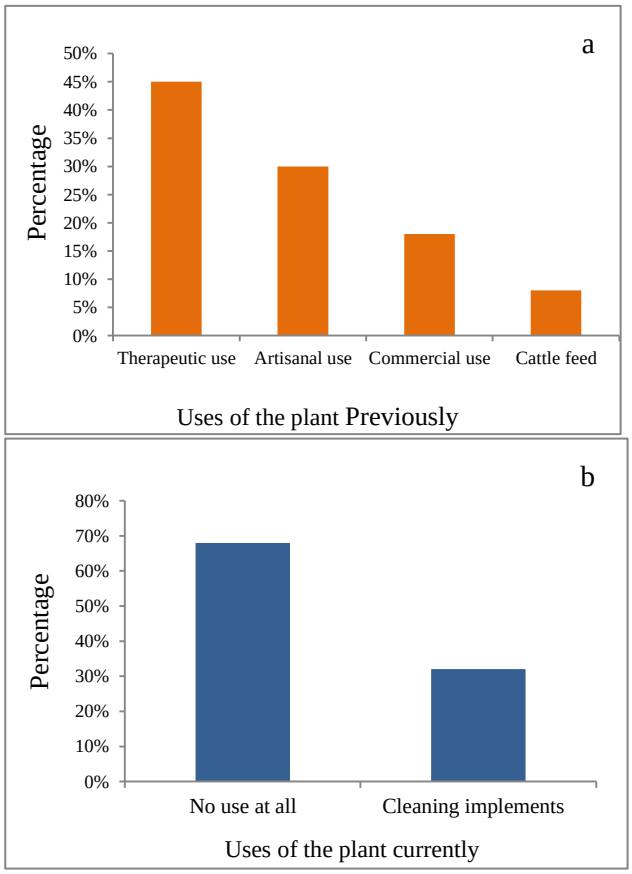

Figure 3: Distribution of different uses of *Chamaerops humilis L.*
(a) Uses of the study plant previously; **(b)** Uses of the study plant presently

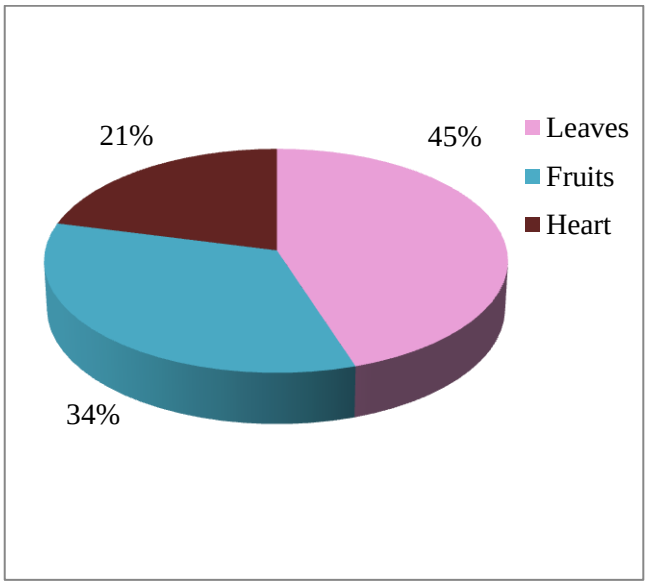

Figure 4: Breakdown of the different parts of *Chamaerops humilis* L. used

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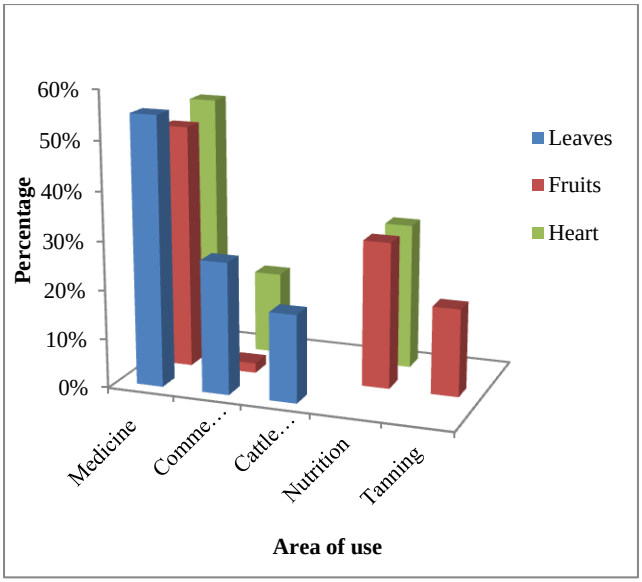

Figure 5: Distribution of the different areas of use of the different parts of *Chamaerops humilis* L.

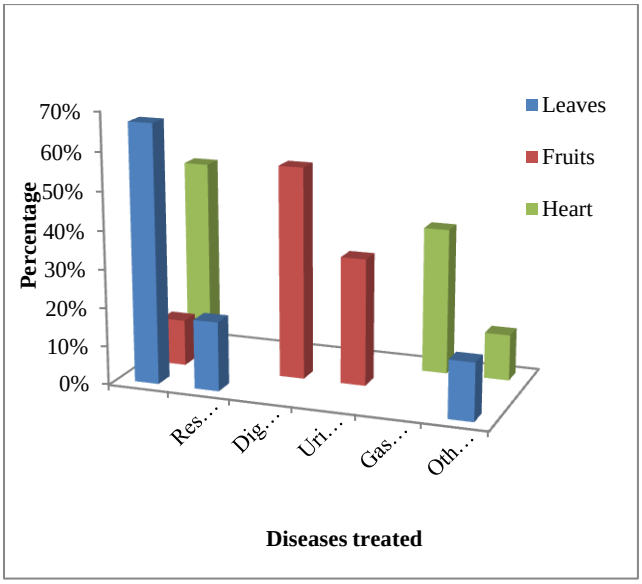

Figure 6: Distribution of the different parts of *Chamaerops humilis* L. used for disease treatment

Table 1: Pharmacological properties of *Chamaerops humilis* L

Property	Dose/ exposure route	Part of plant/extract	Treatment duration	References
Antidiabetic effect	10 mg/kg / single oral dose	Aqueous leaf extract	30 days	[12]
Enzyme inhibiting activities	-	Leaves, seeds, pulp, and peel extracts	-	[29]
Antioxidant activity	-	Ethyl acetate and methanol-water of fruits	-	[30]
Antifungal activity	-	Essential oil	-	[31]

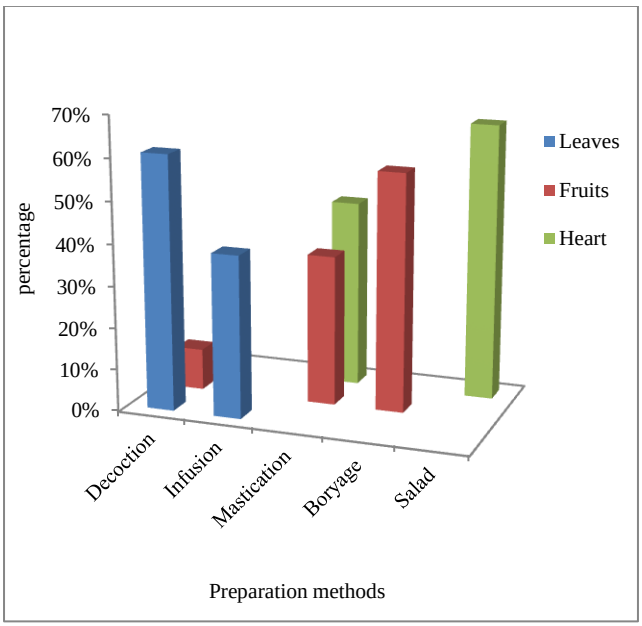

Figure 7: Distribution of preparation methods of the different parts of *Chamaerops humilis* L.

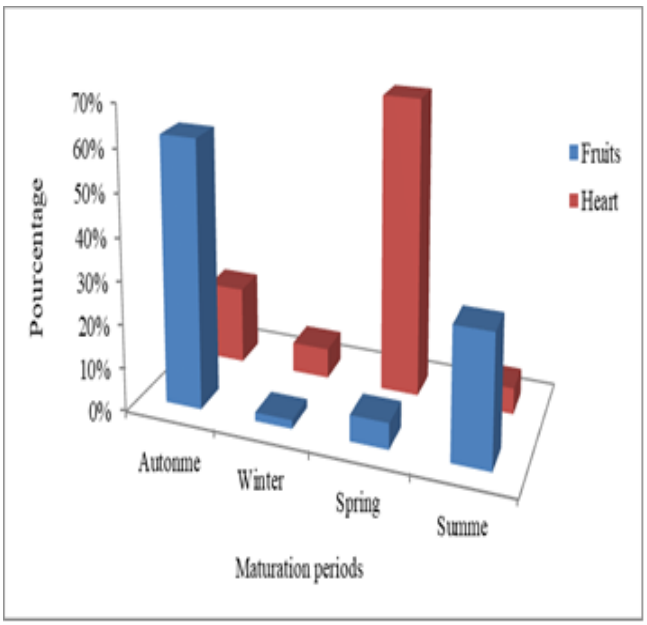

Figure 8: Distribution of the maturation period of two parts of *Chamaerops humili.* L.

Conclusion

The findings of this study revealed that *Chamaerops humilis* L. is an important herb for the daily life of the commune of Sidi Youssef Ben Ahmed, province of Sefrou in Central Morocco. It offers a wide range of utility for the treatment of different ailments including diabetes, digestive disorders, and urinary tract infections. As a result, the sustainability and conservation of this species are not a concern in the region. Furthermore, the traditional use of *Chamaerops humilis* L. from Sidi Youssef Ben Ahmed can be rationalized by pharmacological activities in relevant experimental trials. In effect, these studies will lead to a better knowledge of the biological properties of *Chamaerops humilis* L.

Conflict of Interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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