

## Ethnobotanical investigation of *Chamaerops humilis* in the area of Beni Snous (Western of Algeria)

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**Abstract.** The ethnobotanical potentials of *Chamaerops humilis* in the Béni Snous region (south-west of Tlemcen, western Algeria) has been studied to know the therapeutic utilities and the practices of the local populations, in order to valorize this resource. A series of ethnobotanical surveys were carried out using a questionnaire on the 3 municipalities of Beni Snous (Beni Bahdel, Azail, and Beni Snous). The frequency of use of *Chamaerops humilis* in the region of study is closely related to the profile of the investigated people. The results of this study reveal that *Chamaerops humilis* parts are used for therapeutic purposes by the local population: the heart of stipe as to treat dyspepsia (gastrointestinal attacks, 93.90%), fruits as an antiseptic (70.73%), roots for anemia (36.55%) and intestinal worms (30.10%), while the leaves are often used to treat diabetes (21.62%) and other gastrointestinal disorders (30.1%).

**Keywords:** *Chamaerops humilis*; ethnobotanical surveys; traditional medicine; medicinal uses; Algeria.

### Estudio etnobotánico de *Chamaerops humilis* en el área de Beni Snous (oeste de Argelia)

**Resumen.** Se ha realizado una investigación sobre los potenciales etnobotánicos de *Chamaerops humilis* en la región de Béni Snous (sudoeste de Tlemcen, oeste de Argelia), con el fin de conocer los usos de esta planta en las comunidades locales y cuantificar su valor como recurso. Se realizó una serie de encuestas etnobotánicas utilizando un cuestionario sobre los 3 municipios de Beni Snous (Beni Bahdel, Azail y Beni Snous). La frecuencia de uso en la región de estudio está estrechamente relacionada con el perfil de las personas investigadas. Los resultados revelan que las partes de la planta que se utilizan con fines terapéuticos por parte de la población local son: la zona interna del tronco se utiliza para tratar la dispepsia (93,90%), los frutos tienen valor como antiséptico (70,73%), las raíces se utilizan para la anemia (36,55%) y las lombrices intestinales (30,10%), mientras que las hojas a menudo se usan para tratar la diabetes (21,62%) y otros trastornos gastrointestinales (30,1%).

**Palabras clave:** *Chamaerops humilis*; encuestas etnobotánicas; medicina tradicional; usos medicinales; Argelia.

### Introduction

Medicinal plants remain as a source of medical care in the developing countries, in the absence of a modern medical system (Tabuti *et al.*, 2003). The use of medicine based on plants is deeply rooted in our culture because Algeria is deemed by the richness of its medicinal flora, which includes hundreds of plant species. As well, that it has a knowledge tested a long time ago by our ancestors. At the same time, all cultures and civilizations of the antiquity to our days depend entirely or partially of the herbal medicine due to their effectiveness, accessibility, availability, low toxicity, and acceptability (Akharaiyi & Boboye, 2010). Several plants can be a healing of many of the evils of daily newspapers, which range from simple digestive disorders up to the treatment of chronic diseases such as cancer, ulcers, diabetes, kidney stones (Passalacqua *et al.*, 2006; Dellil, 2007; Squalli *et al.*, 2007; Rammal *et al.*, 2009). *Chamaerops humilis* is a concrete example given as a taxon of high-value pharmaceutically and in ethno

(Bellakhdar *et al.*, 1991; Aliotta *et al.*, 1994; Halimi, 1997; Blumenthal *et al.*, 2000; Beghalia *et al.*, 2008; Hasnaoui *et al.*, 2011; Benmahdi *et al.*, 2012). In western Algeria, *Chamaerops humilis* is considered as species of degradation of forest formations, it has an important role in residual ecosystems, due to its reduced water, and more generally to its adaptation on the ecological constraints and anthropogenic sources (Hasnaoui *et al.*, 2006). Moreover, it is certainly one of the taxons presenting a great socio-economic interest for the local populations, where it is used for manufacturing an innumerable article of esparto manufacture for the transport of olives, grapes and other fruits, and fish (Hasnaoui *et al.*, 2011). It is probable that the shoddy fiber of leaves was used in the past as well as nowadays to make ropes, whereas the heart of the palm tree is used for consumption as a food (Hasnaoui *et al.*, 2011). In effect, this taxon is threatened of disappearance in certain parts of the area of Tlemcen (Hasnaoui *et al.*, 2006). In this sense, the ethnobotanical studies seem like a good approach for understanding in a given area, the uses

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as well as the socio-cultural and economic perceptions of plant resources by local populations (Agbogidi, 2010). The factors that affect the used forms and the value given to the plant resources by the communities are still the subject of discussion in the scientific literature. The forms of use may vary depending on the resources exploited the area, the gender, sex and ethnic groups (Belem *et al.*, 2008; Camou-Guerrero *et al.*, 2008). In this context, an ethnobotanical study on *Chamaerops humilis* has been undertaken in the area of Beni Snous (Tlemcen) in order to identify the therapeutic utilities and the practices of the local populations as a function of the specificities of each prospected locality. The taking into account of these specificities through the ethnobotanical determination of the practical values of *Chamaerops humilis* in each locality could not only help to define in the programs of development, the parties qualified for the conservation, but also those which contribute to good beings of the local populations.

## Material and Methods

### Study area

The area of Beni Snous located in the south-west of Tlemcen extends on a surface of 55543 ha. Administratively, this region includes three municipalities (Figure 1): Beni Snous (37495 ha), Azails (12032 ha) and Beni Bahdel with a surface of (6016 ha). It is an area with strongly broken relief where 80 percent of its territory is largely mountainous characterized by a poverty of the soil and excessive erosion. The remaining 20% are represented by the valleys and the most important are those of El Khémis. Beni Snous currently has a population of 21615 inhabitants with a density of 52.1 inhabitants/km<sup>2</sup>, its economy is based mainly on agriculture and breeding, which remain the sources of 31% of employment (Anon., 2013).

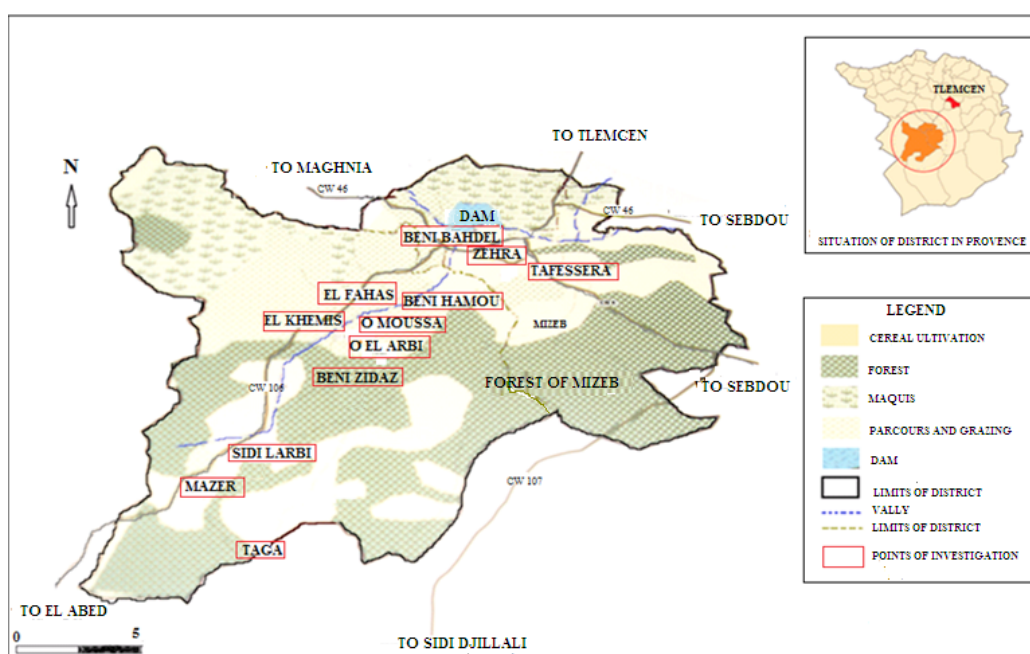


Figure 1. Localities investigations in the zone of study

### Methodology

The methodology of approach is an ethnobotanical investigation conducted in the area of Beni Snous, who were selected for their floristic diversity, ecological and climatic, that offer to the local population a knowledge rather rich in traditional phytotherapy, and owing to the fact that the traditional healers are famous to have a good knowledge of the use of medicinal herbs. This study is carried out on the one hand according to a sampling plan and on the other hand, using 300 cards of investigation (Figure 2).

The localization of the different environments has been marked by the techniques of stratified sampling (Daget & Godron, 1982; Kahouadji, 1986). These techniques appeared adequate to carry out ethnobotanical investigations that varied from one area to another in the studied areas (Hseini & Kahouadji, 2007). Then the sample was divided into three strata corresponding to

the numbers of the municipalities of the area of Beni Snous. Samples of 100 people formed each stratum (municipalities) and they are put together to constitute the total sample (300 people; Table 1).

Table 1. Distribution of surveyed by each layer

Name of layers	N. investigations / layer
Layer 1. Municipality of Blessed Bahdel	100
Layer 2. Municipality of Azail	100
Layer 3. Municipality of Béni Snous	100
Total sample	300

During each service, we have collected all information on the respondent to know the age, level of education, place of residence, family situation and the utilities of the plant. The interviews semi-structured by group has been made according to the method described by Wentholt

*et al.* (2001), which consists in questioning the women and men separately using the local language. As well as the choice of persons to inquire was done in function of their availability, but also we have referred mainly to the elderly of 30 years and more. The limitation of the age to 30 years is due to the fact that to have useful information and original on the popular use of *Chamaerops humilis* (hereafter *Ch. h.*) in traditional medicine; it is necessary to have a certain Physical and Cultural maturity to acquire these assets on this area.

The ethnobotanical information collected on the ground have been listed on the fact sheets of raw data and then transferred into a database, processed and analyzed in order to obtain the standardized data on the following aspects: Frequency of medicinal use of *Ch. h.* in the study region, typology of responders, medicinal uses awarded (used parts, diseases treated). Variance analysis tests (ANOVA) were used to compare the frequency of use in the traditional herbal medicine according to the profiles of the respondents (common prospect, sex, age, level of study, family situation) with the aim to highlight these affinities or particularities. Data from ethnobotanical surveys were analyzed by multivariate analysis (factor analysis of correspondence). These factorial correspondence analyses (FCA) aimed to establish a spatial mapping of the main diseases treated by *Ch. h.* in order to translate this traditional knowledge into scientific knowledge to revalue it, conserve it and

to use it in a rational manner. These different treatments were made using minitab16 processing software.

## Results

### Frequency of medicinal use of *Chamaerops humilis* according to the typology of the respondents

The ethnobotanical survey carried out in the Beni Snous region made it possible to interview people of both sexes (men and women), aged 30 to over 60, married and single and at different intellectual levels, who informed us on the local therapeutic and traditional applications of *Ch. h.*. The survey data were grouped by prospected commune, sex, age group, family situation and by level of study in order to be able to determine the response rate of respondents by category across the region.

### Commons explored

Overall, three hundred persons belonging to three municipalities in the region of Beni Snous were questioned. All persons who have been asked during our investigations knew *Ch. h.*. Table 2 contains the statistical results of the ethnobotanical investigation in the three municipalities explored. The ANOVA showed that the frequencies of medicinal use of *Ch. h.* in the 3 municipalities did not differ significantly ( $p > 0.05$ ) respect to the participant people.

**Questionnaire:**

Please put a cross in the box that you consider suitable.

Answer, please, in a precise and honest way and thank you for your collaboration.

1. Age : [30 to 40]  [40 to 50]  [50 to 60]  more than 60 years
2. Sex: Men  Women
3. Municipality: Beni Snous  Azail  Béni Bahdel
4. Level of study: University  Secondary  Primary  Illiterate
5. Marital status: Single  Married
6. Do you know *Chamaerops humilis* (doum)?  
Yes  No
7. Is this plant useful to you in traditional medicine?  
Yes  No
8. If so, with which disease do you use it?
9. Which part of the plant is concerned?  
Leaves  Heart of the feather-  Roots  Fruits
10. How do you proceed?  
Maceration  Decoction  Fumigation  Powders  Salad
11. When you want to use this plant, you address yourselves to:  
Experiment of the other  Herbalists (Achab - Attar)  Books  Stops with ear

Figure 2. Questionnaire used in the ethnobotanical study

Table 2. Statistical results of the investigation into *Chamaerops humilis* in the area of Beni Snous.

	Knowledge of the plant		Information on the medicinal use among those which know it	
	Yes	No	Does not know any the medicinal use	Using knows some the medicinal use
Beni Bahdel	100	00	18	82
Azail	100	00	26	74
Beni Snous	100	00	7	93

### Sex

In the study area, men and women are concerned by the traditional medicine. The results obtained show that they have a frequency of users very close to 80%

for women and 84.71% for men (Figure 3a). The analysis of variance shows an insignificant effect of sex of belonging on the frequency of the users of the *Ch. h.* ( $p > 0.05$ ) in traditional medicine in the area of study.

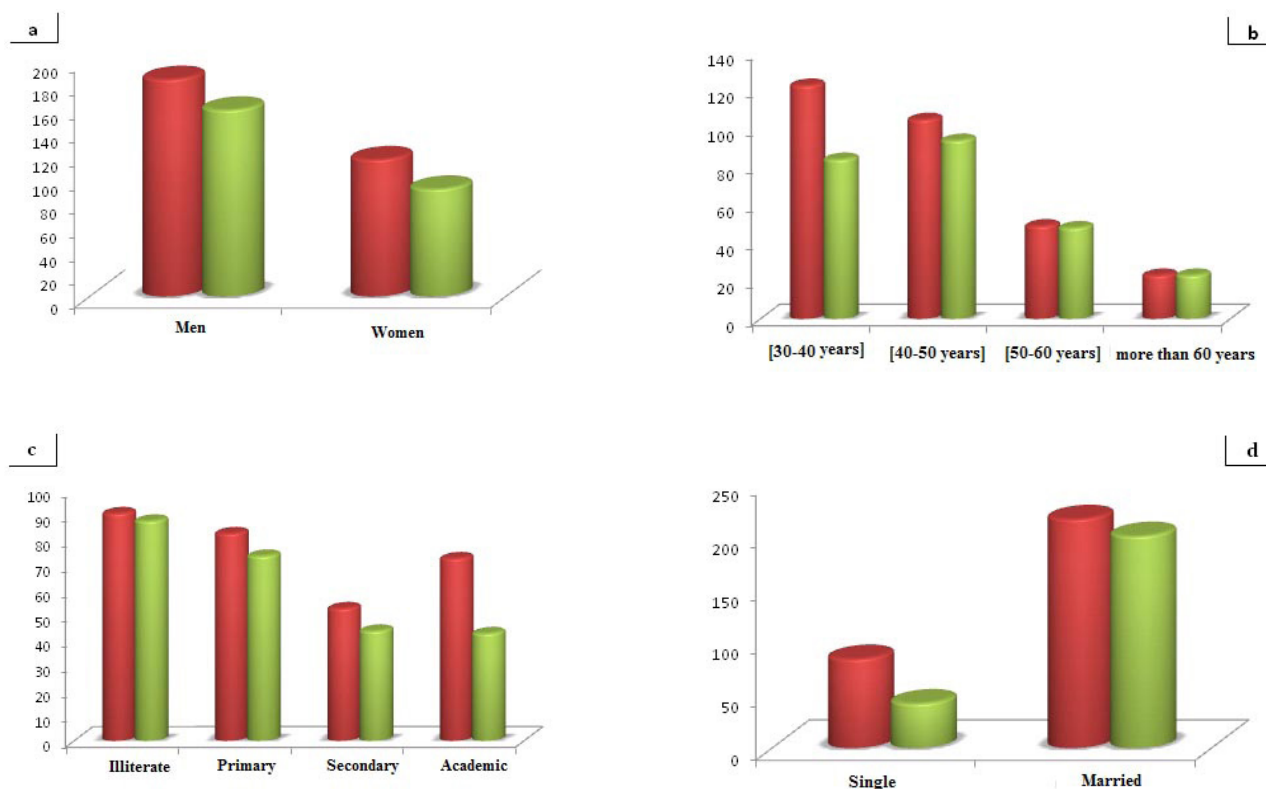


Figure 3. Distribution of *Chamaerops humilis* use according to the sex (a), age (b), the intellectual level (c) and marital status (d). Red bars indicate n. of people investigated and green bars indicate n. of people using *Chamaerops*.

### Age bracket

The data processing enabled us to obtain Figure 3b, which shows that at the level of the area of study, the frequency of use of *Ch. h.* in traditional medicine evolved respectively with the age group. The elderly people more than 60 years have the frequency of the most representative use with 100%. Come then respectively the age brackets [50–60 years], [40–50 years] and [30–

40 years] 98; 89.5% and 68.3%. The variance analysis (ANOVA) shows a significant effect of the age group on the frequency use of *Ch. h.* in phytotherapy ( $p \leq 0.05$ ).

### Level of studies

In the 3 targeted municipalities, the vast majority of the users of the *Ch. h.* are illiterate with an average of

96.7%. Nevertheless, people having level of primary and secondary study have a considerable percentage of use which is respectively of 89.2% and 83%, whereas those having academic level studies use very less this medicinal plant with a percentage of 58.9% (Figure 3c). The variance analysis (ANOVA) shows a significant effect of level of study of the populations surveyed on the frequency of the medicinal use of *Ch. h.* ( $p \leq 0.05$ ).

### Family situation

The investigation carried out in the region of study shows that *Ch. h.* is used much more as medicinal herbs by the married persons (92.5%) than by the single ones (50.3%) (Figure 3d). The variance analysis of (ANOVA) shows a significant effect of the family situation on the frequency of the medicinal use of *Ch. h.* in the three municipalities explored ( $p \leq 0.05$ ).

## Medicinal uses of *Chamaerops humilis*

### Parts used

Various parts of the plant are exploited by the local populations. Table 3 presents the response rate related to the use of each part of the plant. It is clear from these results that each part of the plant (root, the heart of stipe, fruit, leave) is used in the traditional way by the investigations of the 3 targeted municipalities, and we note a certain variability of responses of a municipality to another. The heart of stipe is the part most commonly used in the three municipalities with an arithmetic average of 62.56% and a frequency of use of up to 74.39% (Beni Bahdel). Then come the roots and fruits respectively with an average of 48.88% and 43.26% and a maximum value of 59.45% (Azail) and 58.53% (Beni Bahdel). The leaves occupy the fourth place with an average use of 28.85% and a maximum frequency of 40.86% (Beni Snous).

Table 3. Rate of response of use of the leaves, roots, hearts of stipe and fruits of *Chamaerops humilis* by the populations of the 3 surveyed municipalities.

	Leave	Root	Heart of stipe	Fruit
Beni Bahdel	14.63	46.34	74.39	58.53
Azail	31.08	59.45	64.86	54.05
Beni Snous	40.86	40.86	48.38	17.2
Average	28.85	48.88	62.54	43.26

### Treated diseases

*Ch. h.* is a medicinal plant having a therapeutic effectiveness proved by the local populations of the three-targeted municipalities. The use of various parts of the plant in the traditional pharmacopoeia constitutes an important social aspect in the life of the rural communities of Beni Snous

(Table 4). The majority of peasants recognize at least a therapeutic virtue for each part of the plant. The factorial analysis of the correspondence carried out shows that with the first two axes, we explain 97.4% of the information on treated diseases by prospected municipalities. Figure 4 gives a projection of the various treated diseases and municipalities prospected on the first two factorial axes.

Table 4. Therapeutic importance of the various parts of *Chamaerops humilis* by municipality

Part used	Treated diseases	Use Methods	Percentage (%) of the guarantors by commune		
			Beni Bahdel n=82	Azail n=74	Beni Snous n=93
Leave	Diabetes	Maceration	17.07	21.62	13.97
	Hepatitis	Maceration	9.75	14.86	8.60
	Dyspepsia (Gastrointestinal problems)	Decoction	12.18	18.91	<b>30.1</b>
Root	Hepatitis	Maceration	13.41	16.21	21.50
	Anemia	Maceration	13.41	31.08	<b>36.55</b>
	Intestinal worms	Decoction	2.43	13.51	30.10
	Cleaning the uterus after childbirth	Decoction	1.21	6.75	5.73
	Diabetes	Decoction	0	4.05	8.60
	Rheumatism	Poudre	7.31	0	8.60
	Heart of stipe	Dyspepsia	Salad	<b>93.90</b>	77.02
Heart of stipe	Hypertension	Salad	1.21	4.05	1.07
	Cardio vascular diseases	Salad	2.43	0	4.30
	Diabetes	Salad	13.41	17.56	11.82
	Fruit	Gingiva	Poudre	3.65	0
Fruit	Influenza	Poudre	1.21	1.35	7.52
	Coughing	Decoction	4.87	0	9.67
	Asthma	Maceration	1.21	2.70	9.67
	Attacks of the digestive tract (disinfectant)	Maceration	<b>70.73</b>	47.29	6.45
	Dyspepsia	Salad	62.19	27.02	37.63

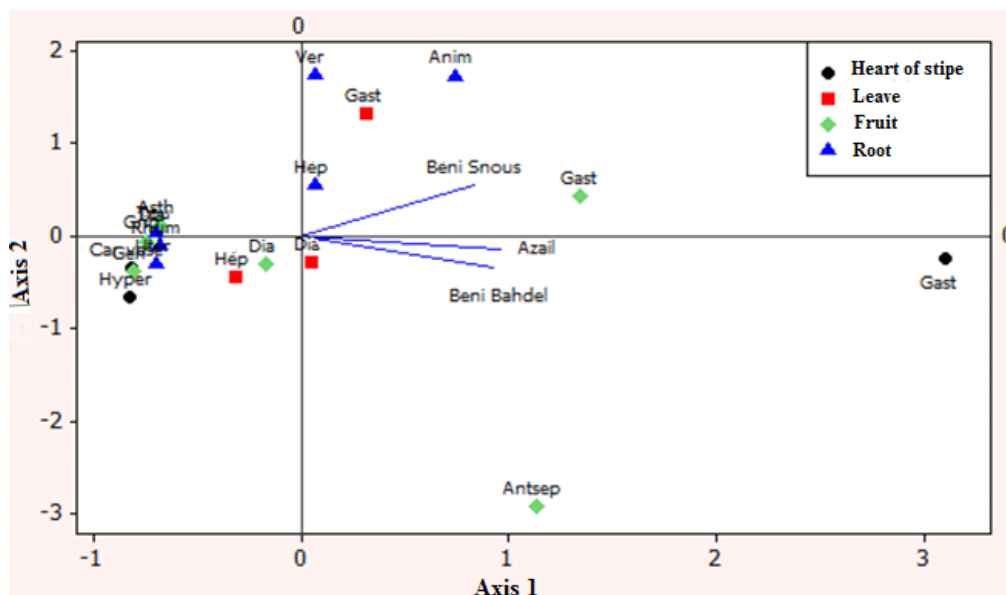


Figure 4. Chart of the various treated diseases and Communes prospected on the factorial axis 1 and 2.

Abbreviations are: Dia: diabetes; Hép: hepatitis; Gast: gastrointestinales attacks; Anim: Anemia; Ver: intestinal worms; Utér: cleaning of the uterus after accouchement; Rhum: rheumatism; Hype: hypertension; Car vas: cardio vascular disease; Gen: gingiva; Grip: influenza, Tou: coughing; Asth: asthma; Antsep: dyspepsia or disinfectant.

The analysis of this figure reveals that in the populations use much more the heart of stipe of the *Ch. h.* as salad to treat the gastro intestinal attacks. The local populations of Beni Bahdel and Azail often use the macerated fruits such as antiseptic. Whereas in Beni Snous municipality fruits are eaten as a salad to cure gastro-intestinal disorders. We also note that the populations use the macerated leaves for the diabetes and the roots for the anemia. The other diseases show similar trends with the use of the bodies of the *Ch. h.* in the three-targeted municipalities.

## Discussion

The ethnobotanical investigation carried out in the study area made it possible to interview 300 people; 83% of them use *Ch. h.* as medicinal users, 82 of them belonging to the municipality of Beni Bahdel, 74 of Azail and 93 of Beni Snous municipality. The results of investigation reveal that men and women are concerned with traditional medicine with 84.21% respectively compared with 80.90% of the questioned female population.

The data analysis shows a non-significant effect of prospected municipalities and the sex of membership on the curative frequency of use of *Ch. h.* ( $p \geq 0.05$ ). This can be explained by the use of *Ch. h.* by men in domains other than therapy. Our results support with ethnobotanical work accomplished by Hmamouchi (2001), Mehdioui & Kahouadji (2007) and Benkhniqne *et al.* (2011) who showed that men and women are holders of the traditional phyto-therapeutic knowledge.

This is also not the case for studies that have shown that ethnobotanical knowledge related to species varies mainly with sex and ethnic group (Hanazaki *et al.*, 2000; Ayantunde *et al.* 2008; Camou-Guerrero *et al.*, 2008; Ekué *et al.*, 2010; Fandohan *et al.*, 2010;

Gouwaknnou *et al.*, 2011; Assogbadjo *et al.*, 2011). In addition, this study shows that therapeutic knowledge is widespread throughout the local population of different age class, intellectual level and family situation. With a predominance at the old investigations more than 60 (100%) illiterate (96.7%) and married (92.48%).

This reflects the long accumulated experience of these elderly people and the fact that they hold a good deal of ancestral knowledge that is transmitted orally. The strong percentage of use of *Ch. h.* also allows minimizing the very expensive expenses of the pharmaceuticals products from the therapeutic valorization of the plant by the married natives. This way of making allowed a traditional accumulation of the ethnobotanical values of the plant (Table 4).

The analysis of the data showed a significant effect of the age group, level of study and family situation on the frequency of medicinal use of *Ch. h.* ( $p \leq 0.05$ ). These results are similar to those reported by several authors (Mehdioui & Kahouadji, 2007; Benkhniqne *et al.*, 2011; Hasnaoui *et al.*, 2011).

This ethnobotanical investigation also reveals that all parts of *Ch. h.* are solicited for therapeutic purposes by the local population of the study area. The percentage of use of these parts (Table 3) shows that the stipe's heart (62.54%), roots (48.88%) and fruits (43.26%) are respectively the most exploited parts by the inhabitants of the study area. The organ removed depends on the medicinal utility searched by the population.

The heart of stipe is often used in the treatment of gastrointestinal diseases. Fruits as an antiseptic, roots for anemia and intestinal worms. While leaves are often used to treat diabetes and gastro intestinal attacks. We have observed that often different parts of the plant are used to treat the same disease (such as diabetes, hepatitis ...), although not very notable differences of

usage modality (maceration, salad...) are highlighted (Table 4).

Different descriptive studies have identified the role of *Ch. h.* in traditional medicine throughout the world. According to Bellakhdar *et al.* (1991) and Aliotta *et al.* (1994) an aqueous solution based on leaves of *Ch. h.* is used in Morocco for its hypoglycemic effect. In addition, the berries are presumed to have anti-inflammatory, anabolic, urinary antiseptic, antilithic, and diuretic properties (Bellakhdar *et al.*, 1991; Blumenthal *et al.*, 2000; Beghalia *et al.*, 2008; Hasnaoui *et al.*, 2011). Merlo *et al.* (1993) noted that fruits have also been used in traditional medicine as astringent because of their bitterness and tannin content. The impact of the gathering of medicinal herbs on the environment, the heart of the stipe and roots are harvested without concern for survival of *Ch. h.*. Their collection on a large-scale can constitute a real threat to the species' survival.

These results revealed that local people are obliged to tear off the whole plant when are interested in different parts of the plant. Another threat influences *Ch. h.* is the difficult regeneration by seed due to the strong tegument inhibition of them (Médjati *et al.*, 2013). There is an obvious relationship between the part used by and the effects of this exploitation on the conservation of this species (Cunningham, 1996) but also the pattern of sampling the leaves and its intensity can have some

beneficials on the regeneration of the species (Botha *et al.*, 2004; Gaoué & Ticktin, 2007).

This report could seriously be compromise of the durability of *Ch. h.* in the area. Therefore, it is important to sensitize local populations on the rational techniques of sampling parts of *Ch. h.* especially, and medicinal herbs in general, in order not to start the possibility of benefiting permanently from invaluable services of this last.

## Conclusion

*Ch. h.* is an important plant for the daily life of the inhabitants of the areas of Beni Snous. It offers wide opportunities for the treatment of diseases to the local population. Nevertheless, the utility value of *Ch. h.* in the area of Beni Snous can be an asset in favor of their conservation. As a result, the sustainability and the conservation of the species are not a concern in the area.

However, studies that are devoted to the evaluation of ethnobotanical potentials are rare in the region. In effect, these are the types of studies, which will lead to a better knowledge of the species in view of its conservation because the latter requires local knowledge, the knowledge of biological characteristics and the development of techniques to spread.

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