Traditional use of *Matricaria pubescens* (Desf.) Schultz in two regions of southern Algeria and contribution to study the antioxidant activity

Hamida Saida Cherif*, Rekia Ferrah, Amel Bennacer, Ghania Tail & Fairouz Saidi
Laboratory of Biotechnology, Environment and Health, Department of Population and Organismal Biology, Faculty of Natural and Life Sciences, University of Blida1, Route de Soumaa, BP270, Blida, Algeria
E-mail: cherifhamida@yahoo.fr

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Algerian flora holds a rich diversity of medicinal and endemic plants, many of which are used in Algerian traditional medicine and have the potential to provide pharmacologically active natural products. The present study focuses on a spontaneous species of the central and Septentrional Sahara, *Matricaria pubescens* (Desf.) Schultz. The ethnobotanical survey of 122 people, among herbalists, town’s people and traditional healers took place in two towns; Tamenrasset and Bechar. Various informations were collected on the traditional use of the chamomile of the Sahara, its various vernacular names (*Ouazouaza*) and preparation methods, such as decoction (38.80 %). Similarly, it was proved that many diseases are treated by the use of *Matricaria pubescens* (Desf.) Schultz, such as joint disease (26.20 %), fever (17.50 %), cough (14.50 %), and asthma (11.70 %). Regarding the toxicity of the plant, the majority of respondents (96.70 %) reported the absence of side effects. The survey on the field was very profitable, therefore, the Sahara chamomile is a species to preserve and increase. The phytochemical screening revealed the presence of tannins, coumarins, flavonoids and saponins, the antioxidant power of infused is put out by the iron reduction method (FRAP) and it proved good comparing with ascorbic acid (vitamin C).

**Keywords:** *Matricaria pubescens* (Desf.) Schultz, Ethnobotanical survey, Tamenrasset and Bechar (Algeria), Antioxidant activity

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In recent decades there has been an increasing interest in the study of medicinal plants and their traditional use in different regions of the world⁴. The ethnobotanical survey has proved one of the most reliable ways for the discovery of new drug approaches. The study was conducted in order to gather information on the Sahara chamomile and its therapeutic uses practiced in Tamenrasset and Bechar (South and south-West of Algeria respectively). *Matricaria pubescens* (Desf) Schultz (Asteraceae), which includes 1500 species²,³ many of which are used in pharmacy⁴ or conservation through their antioxidant properties⁵,⁶. *Matricaria pubescens* (Desf) Schultz is found throughout the northern and central Sahara³, it is an endemic North African species, more common in Ahaggar the sandy, stony and viscous wadis⁶, the steppe and desert pasture⁷. In addition, several biological activities such as anti-inflammatory, antimicrobial and cytotoxic activities are attributed to the chamomile⁸,⁹, and analgesic activity¹⁰. In some areas in Algeria, such as EL Goléa, Beni-Abbes and Ouargla, it has many traditional uses to treat rheumatism, aches, eye diseases, cough, allergy, dysmenorrheal, etc.⁵. This work contributes to the knowledge of an endemic species of the Sahara; our study fits into the framework of the biodiversity valorization of Algerian aromatic plants and their preservation and the enhancement of traditional medicine.

To do so, an ethnobotanical research is important to collect information on the different uses of the Sahara chamomile, with herbalists, traditional healers and some populations of Tamenrasset and Bechar pursue with a phytochemical screening and a test of the antioxidant activity.

**Methodology**

**Ethnobotanical survey**

The ethnobotanical survey was conducted in two regions in the South of Algeria “Tamenrasset and Bechar” Fig. 1. Both of them have a hot desert climate, with a very hot summers and mild winters. There is a very little rain throughout the year; the rainfall is 46 mm for Tamenrasset and 100 mm for Bechar. Tamenrasset lies at an elevation of 1392.5 m and its coordinates are 22° 46’N for the North latitude and longitude 05°29’ E, however Bechar lies at an
elevation of 1206 m and its coordinates are 31°42’ N for the North latitude and longitude 01° 58’ E12,13. The investigation lasted 6 months (April 2012-September 2012) with 122 persons including 72 locals, 40 herbalists, and 10 traditional healers. For this purpose, a survey form consists of:

a) Information on the people who were surveyed (age, sex);
b) Information about the local name of the plant, organs or the part which are used, time of harvest, status usage, modes of preparations;
c) Information about the plants used in admixture or mixture with Matricaria pubescens (Desf.) Schultz, treated diseases, the administration mode, and toxicity.

Plant materials
The plant was harvested in the province of Tamanrasset (April 2012), we have collected 1 kg of fresh plants; after removal of Debris, aerial parts of the plant have been kiln dried (23-25 °C) in the open air and protected from light and moisture for 10 days. The dried plants were kept in paper bags until the use.

Phytochemical screening
A phytochemical screening was carried out on the powder and brewed from the plant, the infused was prepared as the following method: 20 g of powder are placed in 100 mL of boiling water, allowed to infuse for 30 min, after filtration, the filtrate is adjusted to 100 mL with distilled water to reveal the presence of Tannins, Anthocyanins, Leuco-anthocyanins, condensed tannins (catechin), Gallic tannins, free Quinones, Quinones combined, Saponins, Alkaloids, Senosids, Coumarins, Flavonoids.

Antioxidant activity “Ferric reducing/antioxidant power (FRAP) assay”
The method is based on the reaction of reduction of (Fe³⁺) present in the potassium ferrocyanide complex (Fe²⁺), the reaction is indicated by the yellow transfer ferric iron (Fe³⁺) blue green color ferrous iron (Fe²⁺), the intensity of this color is measured by spectrophotometer at 700 nm15.

The protocol used
0.5mL of the infused at different concentrations (0.2 mg / mL, 0.4 mg / mL, 0.8 mg / mL, 1.2 mg / mL, 1.6 mg / mL, 2 mg / mL) were mixed with 1.25 mL of a phosphate buffer solution to 0.2M (pH= 6.6) and 1.25 mL of a potassium ferricyanide solution K₃ [Fe (CN)₆] 1 %. Incubated at 50 °C for 20 min, cool to room temperature. Add 2.5 mL 10 % trichloroacetic acid to stop the reaction. The tubes containing the various solutions are centrifuged at 3000 g for 10 min. We recover 2.5 mL of the supernatant, to which 2.5 mL of distilled water was added and 0.5 mL of an iron chloride solution (FeCl₃ 6:20) to 0.1 %, is measured towards the end the OD at 700 nm15.

Results
Through the ethnobotanical survey in the two cities, it is clear that there is a diversity of practice regarding the use of the Sahara chamomile according to the treated symptoms, used parts, methods of preparation and use.

Of the 122 people interviewed, 72 were from Tamanrasset and 50 from Bechar. Information collected after the first record, related to those surveyed was depicted in Table 1. If the number of men surveyed is higher than women, it is never the less established

Fig. 1 — Localization of BECHAR and TAMENRASSET in yellow on the map of Algeria

<table>
<thead>
<tr>
<th>Number</th>
<th>the rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region</td>
<td>Tamanrasset 72 59%</td>
</tr>
<tr>
<td>Sex</td>
<td>Male 82 67%</td>
</tr>
<tr>
<td>Surveyed people</td>
<td>Herbalists 40 33%</td>
</tr>
<tr>
<td>Age</td>
<td>20-40 30 24.6%</td>
</tr>
<tr>
<td>Surveyed people</td>
<td>Town people 72 59%</td>
</tr>
<tr>
<td>Sex</td>
<td>Female 40 33%</td>
</tr>
<tr>
<td>Surveyed people</td>
<td>Traditional healers 10 08%</td>
</tr>
<tr>
<td>Age</td>
<td>20-40 30 24.6%</td>
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</table>
that women are holders of traditional therapeutic knowledge. An ethnobotanical study with the local population of the forest Amsittène from Essaouira (Morocco) reported that women (53 %) had more knowledge on the use of medicinal plants than men (47 %)\(^1\). During the investigation we found that people aged between 40-60 yrs generally had more knowledge on the uses of medicinal plants. *Chamomile* is known with two vernacular names "*Ouzouaza*" and "*Guertoufa*", although confusion with the Sahara chamomile (*Cotula cinerea*). In some areas, the names are sometimes reversed; such is the example of Beni-Abbes, where the common name of "*Guertoufa*" means two distinct species: *Matricaria pubescens* in El Goléa and *Brocchia cinerea*, in Beni Abbes (Bechar region) and Tamenrasset.

**Used parts and condition of uses**

The percentages obtained on the use of plant organs of *chamomile* and condition of use (Table 2), shows that respondents preferentially use the aerial part, then the stem, leaves, and finally branches, more often in the dry state. According to those interviewed, the used plant organ varies depending on the method of preparation of the remedy, and usually it is the aerial part powder that is most cited in traditional recipes.

**Method of preparation**

Determining the method of preparation of the herbal remedy based on different plant parts has a particular importance to define the ideal mode of concentration of active substances and for an effective extract, while avoiding the extraction of toxic substances. Thus, the people interviewed mentioned that there are various modes of preparation from the plant parts. The most used one is decoction (36.6 % and 42.3 %), powder (42.7 % and 19.2 %), infusion (28.9 % and 12.2 %), and maceration (8.5 % and 9.6 %). This result confirms what has been reported by a study\(^6\), citing that chamomile is used instead in decoction. Similarly, in another study of the place of spontaneous plants in traditional medicine in Ouargla region (North East Sahara) it has been observed that the decoction, infusion and maceration were the essential methods of preparation of herbal drugs in traditional herbal medicine\(^17\). The answers to the questions are illustrated in Figs. 1&2. Regarding the plants with which *Matricaria pubescens* mixed. The chamomile is a part of many mixtures used in surveyed regions. The plant is often mixed with tea (39.55 %), *Ruta* (2.23 %), *Artemisia* (7.46 %), Sahara cumin (7.46 %), and other plants. In addition, the chamomile is widely used in the Sahara as an antioxidant, in the preparation of local butter, to preserve meat, as condiment very popular during the fasting period and even to flavored tobacco, because it emits a pleasant odor. Fig. 3 as shows the data collected on different diseases treated by *Matricaria pubescens* (Desf.) Schultz. *M. pubescens* is used first to treat rheumatism (26.20 %), fever (17.50 %), cough (14.50 %), asthma (11.70 %), eye diseases (6.80 %), digestive disorders, diarrhoea, constipation, scorpion stings, and toothache and also to facilitate childbirth (9.7 %) which are similar with what has been

<table>
<thead>
<tr>
<th>Region</th>
<th>Vernacular name of <em>Matricaria</em></th>
<th>Parts used</th>
<th>Method of preparation</th>
<th>Harvest period</th>
<th>Use state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamanrasset</td>
<td><em>Ouzouaza</em> and <em>Guertoufa</em></td>
<td>Aerial parts 42.8%</td>
<td>Decoction 36.6%</td>
<td>Preferably spring</td>
<td>Fresh 36.2%</td>
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<td></td>
<td></td>
<td>Leaf 21.4%</td>
<td>Infusion 12.2%</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Stem 28.6%</td>
<td>Powder 42.7%</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Branches 7.2%</td>
<td>Maceration 8.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bechar</td>
<td><em>Ouzouaza</em> and <em>Guertoufa</em></td>
<td>Aerial parts 74.1%</td>
<td>Decoction 43.3%</td>
<td>Preferably spring</td>
<td>Fresh 31.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leaf 11.1%</td>
<td>Infusion 28.9%</td>
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<td></td>
<td></td>
<td>Branches 3.7%</td>
<td>Maceration 19.2%</td>
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</tbody>
</table>

Fig. 2—*Matricaria pubescens* (Desf.) Schultz added percentage in plant mixtures
revealed in a study of ethnopharmacological study and phytochemical screening of *M. pubescens* from the region of South west Algeria\(^\text{17}\).

*Matricaria* also comes in various traditional preparations, notably in fortifying preparation administered to women after childbirth or to patients during convalescence. Regarding the administration mode of *Matricaria*’s herbal remedies, the most used one is the oral administration, compared to poultice.

In the study of the plants place in traditional medicine in Ouargla region (North East Sahara) it has been reported that the administration of oral product includes most of the preparation methods, such as infusion, maceration, decoction and herbal teas\(^\text{18}\).

A total of 72 urban people questioned about adverse effects and toxicity of *M. pubescens*, the majority (69) reported that preparations based on *Matricaria* haven’t any side effects on them, against two individuals who reported otherwise. Among the side effects, we noted the hypotensive effect for the elderly due to the improper use of infusions. As the regard of the results of antioxidant activity expressed in optical density (OD) reveal that the infused *M. pubescens* and Vitamin C taken as a reference are good antioxidants. It seems that the optical density of the activity increases with increasing concentration, both for the standard and for the infused *M. pubescens*. The results showed that the reducing power of the infused *M. pubescens* for concentrations of 0.04 and 0.2 mg / mL, respectively are (OD = 0.1228) and (OD = 0.3800) Fig. 4. We have demonstrated that the antioxidant activity of infused *M. pubescens* is very remarkable which confirms the results of the ethnobotanical survey. The infused plant contains a significant amount of phenols and flavonoids and coumarins, saponins, tannins, which can play a major role in the antioxidant potential inhibition and the absence or the presence of small amounts of quinones, alkaloids and senosides.

**Discussion**

People aged between 40 and 60 yrs old (Table 2) had more knowledge on the uses of medicinal plants. Indeed, older people are supposed to provide reliable information, because they hold much of the traditional knowledge which is part of the oral tradition. In Exploring of Ecology and ethnomedicine links between current environmental crisis and indigenous medical practices it has been mentioned that knowledge of the uses of medicinal plants and their properties are acquired after a long experience and passed from one generation to another\(^\text{19}\). Regarding the choice of a plant organ, in the study of the place of spontaneous plants in traditional medicine in Ouargla region (North East Sahara) it has been reported that the predominance of the use of a plant organ with respect to another, in therapy, derives from the concentration of active components of this organ\(^\text{18}\). In an Ethnobotanical study with the local population of the forest Amsittène in the town of Imi n’Tlit (Provence Essaouira) it has been reported in their ethnobotanical surveys that plant leaves are the most used parts in traditional preparation\(^\text{16}\). We also found that picking *M. pubescens* is done preferentially in the spring; this result is explained by the fact that the flowering of *chamomile* takes place during the spring in northern Algerian Sahara and at any time after the rain in the central Algerian Sahara\(^\text{9}\). During the ethnobotanical survey we noted that the most used form of preparation is decoction, then powder, infusion and finally
maceration. This result confirms what has been reported in a study of the Hoggar, citing that chamomile is used instead in decoction. Similarly, in study to know the place of spontaneous plants in traditional medicine in Ouargla region (North East Sahara) it has been reported that decoction, infusion and maceration are the essential methods of preparation of herbal drugs in traditional herbal medicine. A large knowledge of how to use the plants against different diseases is quite feasible in areas where the use of plants is still of great importance.

The ethnobotanical survey in the region of the central Sahara (Tamenrasset and Bechar) using a questionnaire permitted to collect information on the Sahara chamomile and its various traditional and therapeutic uses practiced in the study areas. The results of the phytochemical screening were similar with one found in the study of Phytochemical screening and anti-listerial activity of essential oil and crude extracts from some medicinal plants growing wild in Bechar (South- west of Algeria) which support our results also in the ethnopharmacological study and phytochemical screening of M. pubescens from the region of South-west Algeria, it has been mentioned that the therapeutic effects are induced by various chemical compounds such as flavonoid and tannins which constitute the scientific basis for the traditional therapeutic use of the tested plant. The results of the antioxidant activity of the infused aerial parts of M. pubescens (Desf.) Schultz are consistent with those mentioned in a study of the evaluation of antioxidant potential of a plant from the same kind Matricaria chamomilla reveals that the methanolic and ethanolic extract of aerial parts of Matricaria chamomilla showed strong antioxidant activity. This activity could be related in part to their high phenolic compounds which occur in the aerial parts. There are some studies on the same kind Matricaria, it was found that gender Matricaria discoidea rich in flavonoids and highlighted luteolin molecule these are classified in the first range to the anti-oxidant properties. The obtained results have allowed us to particularly distinguish Matricaria pubescens (Desf.) Schultz which is used not only in the treatment of various respiratory and digestive diseases but also as a condiment, a natural preservative, and a powerful antioxidant, indicating its importance in the surveyed populations. Some global observations are noted, such as the loss of popular knowledge which was common to nomadic people of the Sahara. And also we confirmed the presence of an antioxidant activity of the aerial parts of the plant which were mentioned through the results of the ethnobotanical survey. This survey would be an important support for further research to study the phytochemistry and the pharmacology of Matricaria pubescens (Desf.) Schultz in order to discover new natural substances.

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References


