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Article

Marrubium deserti De Noé, a Spontaneous Medicinal Plantfrom Algerian Sahara, An Ethnobotanical Survey

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Abstract : Herbal medicines that constitute a component of traditional medicine are used worldwide as a source of natural remedies especially during the Coronavirus (COVID-19) period. We conducted an ethnobotanical survey in order to collect information on the medicinal plant; *Marrubium deserti* De Noé in Biskra district, Algeria. The study was conducted between the year 2013 and 2014, using structured survey which was given to 135 person chosen at random. The obtained results showed that the suitable timing of *M. deserti* De Noé harvest is spring (57.72%). The fre- quently used part of the plant was leaves (51.35%). The plant was taken orally (54.41%) and was prepared as an infusion form (33.16%). The duration and the frequency of *M. deserti* De Noé rem- edies use are variable according to the diseases treated, with a slight predominance until cure (25.74%). In addition, these remedies are often taken once daily (58%) by the local people. Re- garding the treated ailments, this plant is reported to be used to treat more than one illness. However, fever is the most commonly treated ailment by this plant (27.61%). These findings are important for phytochemical and pharmacological research on Algerian flora in order to search fornewly discovered bioactive compounds and conservation of traditional knowledge

Keywords : Sahara; Ethnobotanical analysis; *Marrubium deserti* De Noé; Spontaneous Plant; Traditional Knowledge

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1. Introduction

Throughout centuries, human beings have mainly relied on plants in their daily lives because they have provided many benefits such as food and drug [1]. Ethnobotany is a field that studies the relationship between plants and people [2]. Native knowledge isthe result of years of experiences, vigilant observations, trials and experiments of many generations and they are now a part of the people's heritage [3,4].

Higher plant diversity is noted in Algeria because of its geographical situation, soil composition and climate variety that play a role in an adapted flora that is rich in medicinal and aromatic plants; Mediterranean in North (known as the Tell), semi-arid in high steppe plains and arid and Saharan climates in the South of the country [5]. For many centuries, in Algeria and the Maghreb countries, many medicinal plants were onlyused in urban areas by in general old people [6]. However, the loss of this associate knowledge has been caused by modern education making the young generation under- value the traditional knowledge. Also, the relocation of people from urban areas to big towns has resulted in the non-use of traditional practices [7]. Hence, the identification of medicinal plants, their usage and side effects will help in the local decision making, with the application of suitable management practices, carrying out pharmacological analyses, and facilitation of finding of new natural products and promotion of sustainability in theusage of natural resources [8,9]. Recent works in Algeria have recorded medicinally im-

portant plants [10-13]. Despite reported medicinal plants, unfortunately, much of the potential is still unknown due to various reasons ranging from a paucity of knowledge to a lack of conservatory efforts.

At present, one of our goals is to protect and improve traditional knowledge using an ethnobotanical survey. Thus, the present study seeks to document the traditional use of *Marrubium deseti* De Noé in targeted areas represented by five municipalities; Ain Zaatout, Biskra, Bouchagroune, Chaiba and El Hadjeb from Biskra district (South-East Algeria).

1. Materials and Methods

1.1. Presentation of the Studied Zones

This work was realized in Biskra Province, situated between 34°51'1''N and 5°43'40''E. This region occupies about 21671 Km² of area and it is approximately 500 km away from the capital Algiers. Five municipalities namely; Ain Zaatout, Biskra, Bouchagroune, Chaiba and El Hadjeb constituted the area of study (Figure 1). The climate data obtained from the National Oceanic and Atmospheric Administration, NOAA [14] showed that the annual mean temperature of this area was 24.4°C for the period of 2000 to 2014 and where January was the coldest month with 11.1°C, while July was the hottest month with34.7°C. From the same periods, the recorded annual rainfall was 123.6 mm in Biskra re- gion, with maximum rainfall recorded in October, while for February, May, July, Sep- tember and November months, only small quantities were recorded.

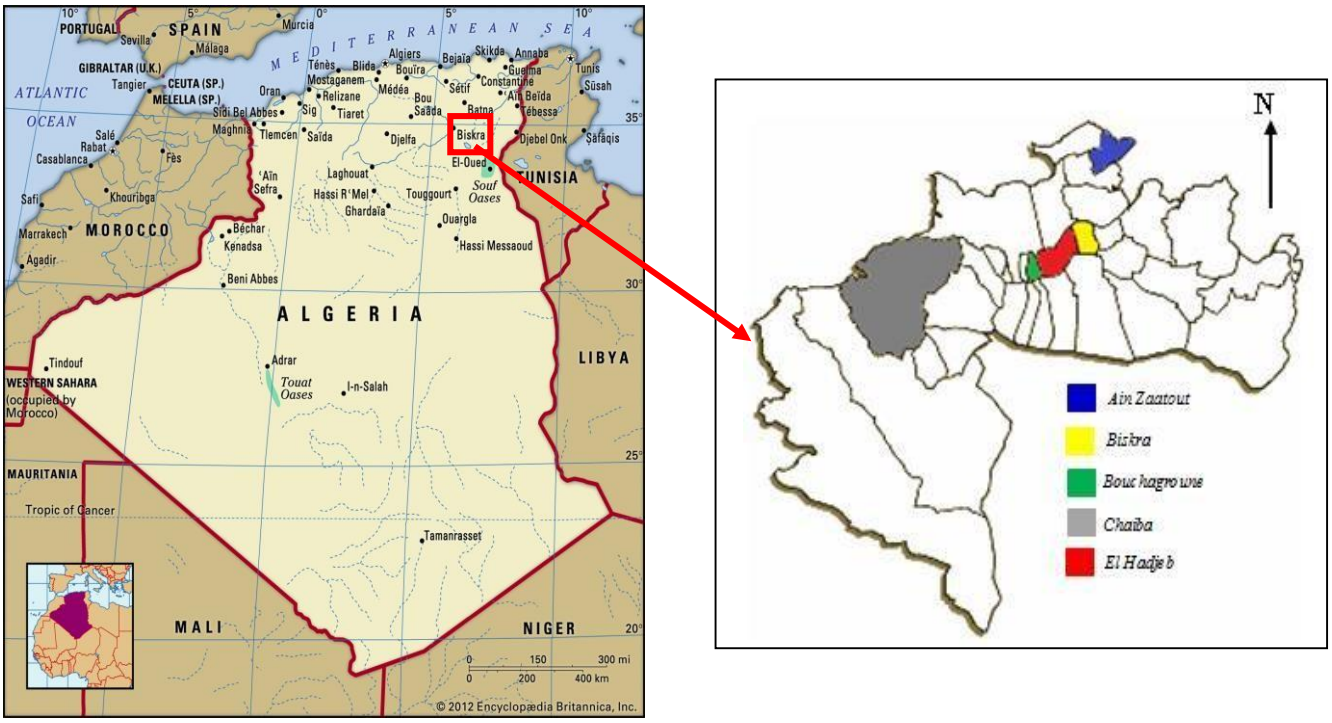

Figure 1. Map of Algeria showing the locations of the studied area

1.2. Data Collection

The method used during this study consisted in collecting data on the use of the medicinal plant *M. deserti* De Noé using semi-structured questionnaires intended for the inhabitants of the five studied municipalities between 2013 and 2014. Ethnobotanical information on this plant were obtained through the conditions and characteristics of the receipts preparation and at last about cases of toxicity related to the use of this plant.

Finally, the collected data was entered into Excel software (Microsoft Corporation, 2007) and summarized by statistical methods (means as well as the percentage and tabulate and graphs drawings). Interviews with local people who were born and lived their entirelives in the studied areas were made. Twenty-seven informants of each studied munici- pality were selected for the interviews on a random basis. These investigations were car- ried out with the local language of each municipality; Arabic in Biskra, Bouchagroune, Chaiba and El Hadjeb and we used the local dialect of Chaoui in Ain Zaatout; to facilitatethe communication with the local population and encouraged them to speak freely. The interrogation concentrated on the informant's socio-demographic characteristics such as sex, age, educational background and the importance of phytotherapy in their lives. During the interviews, the informants were asked also about: local names of the studied plant, timing of plant collection, parts used, diseases treated by this plant, modes of preparations, doses and proportions used, mode of administration, posology, frequency and utilization period.

2. Results

2.1. M. deserti De Noé Description

From the numerous surveys carried out in Biskra, some morphological aspects of the studied plant as well as its distribution in the area of its collection were noted (Figure 2). In the field, *M. deserti* De Noé was growing in association, surrounded by many herbaceous species like *Zilla spinosa*, *Teucrium polium* and *Cassia lanceolata*.

M. deserti De Noé is an endemic medicinal plant that grows in Central and North Algerian Sahara. It is a small shrub, up to 20-30cm of high. Numerous erect stems are covered with hairs giving the plant a woolly appearance. Leaves of stems are small, velvety and opposite, and terminated by variable forms of three large teeth. The flowers are purple and laid in glomerules at the base of the leaves.

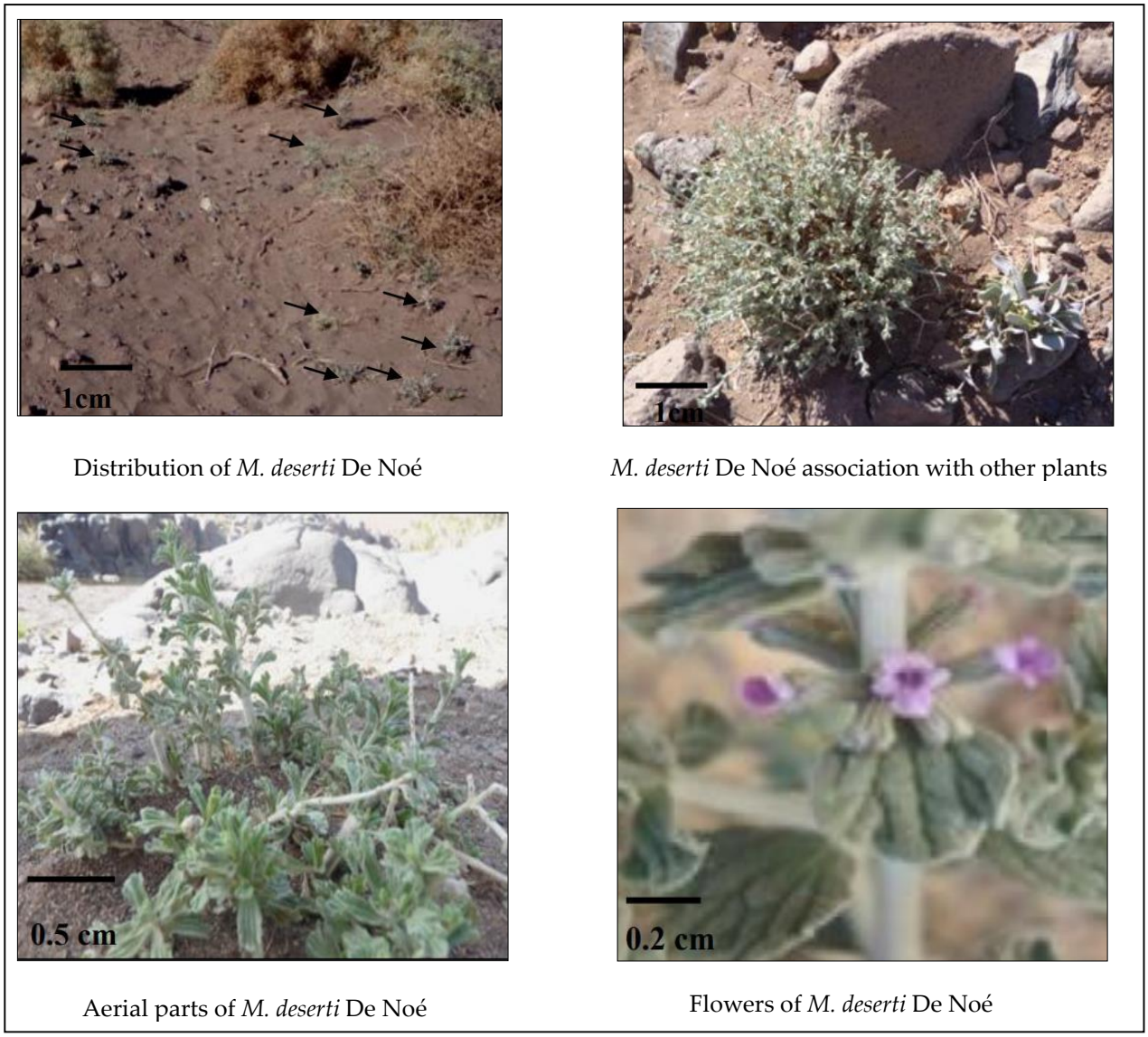

Figure 2. Morphological aspect of *M. deserti* De Noé

2.2. Informant's Profiles

The employment of herbal medicinal treatments has been increasing over the years with approximately 80% of people around the world are relying on them [15]. Indeed, information collected from five studied municipalities showed that the 135 interviewed people were relying on natural remedies as a medication source. As shown in Figure 3a, herbal medicine was preferred as treatment of about 97 informants (72%) compared only with 14 participants who opted for the conventional treatment (10%). Furthermore, 24 informants used herbal medicine in combination with conventional medicine.

Our results showed that both males and females practiced traditional medicine in the five studied municipalities. From the results of the interviewed people, 53% of the informants were women and 47% were men (Figure 3b).

The informant's ages varied from 20 to 97 years old with the mean age of 48. The age groups were as follow: 48.15% age group of [41-60], 29.63% age group of [61-90], 11.85% of age group [20-30], 8.85% age group of [31-40] and finally, the group over 90 years old by 1.48% (Figure 3c).

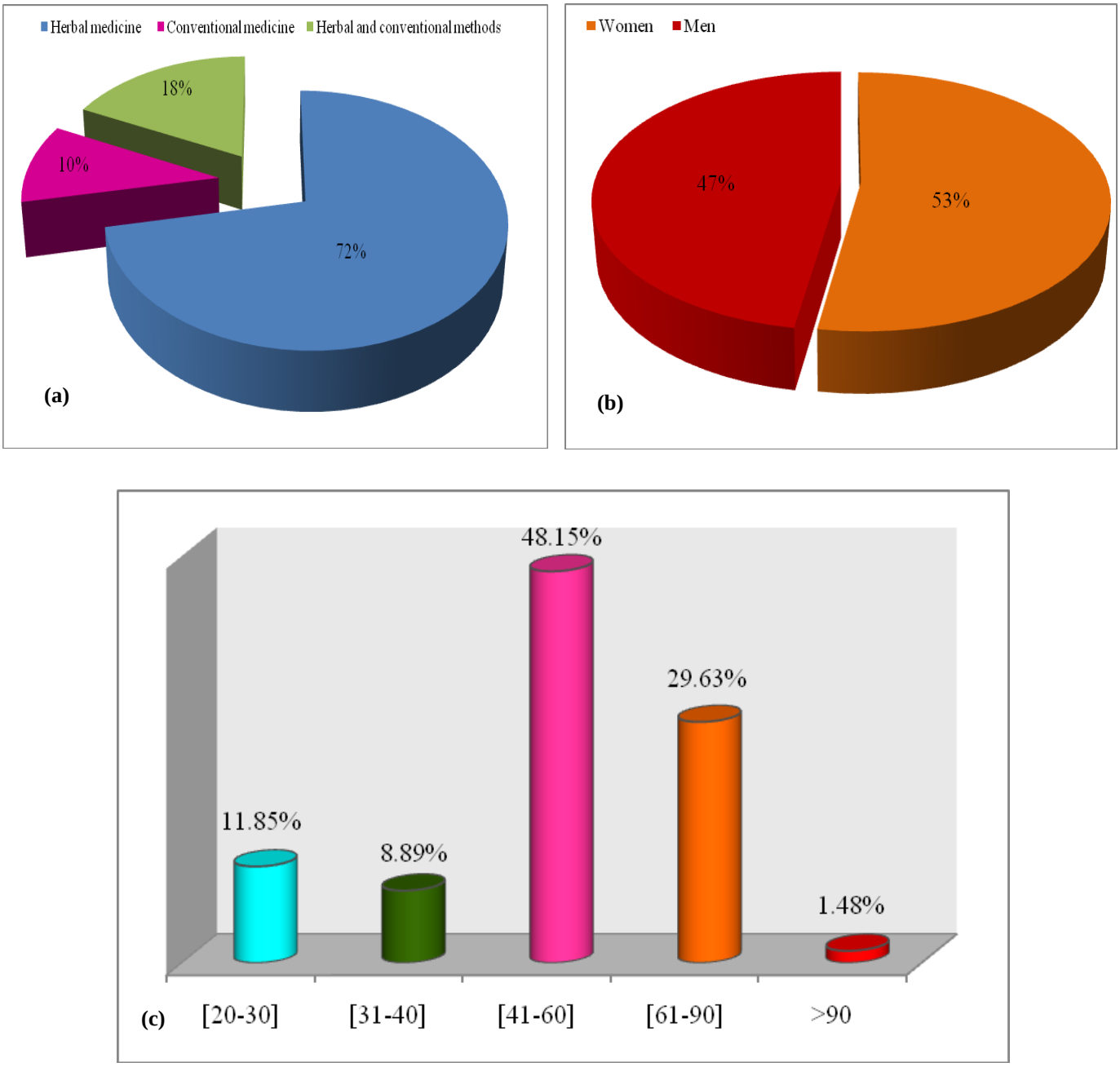

Figure 3. Place of phytotherapy in the studied area (**a**), distribution of gender (**b**) andage (**c**) of informants.

2.3. M. deserti De Noé and Related Knowledge within the Five Studied Municipalities

3.3.1. Timing of Plant Harvest, used parts and condition of preparation

The information concerning the appropriate timing of *M. deserti* De Noé harvest by the local population of Biskra is shown in Figure 4a. The best time of *M. deserti* De Noé harvest was spring (57.72%) followed by summer (16.78%), winter (3.36%) and fall (2.1%). Furthermore, 20.13% of the local population harvested this plant throughout the whole year.

Diverse plant parts (aerial parts, leaves, stem, root or fruit) may use in the preparation of herbal remedies. These preparations are administered orally or applied topically in different forms such as cream, lotion or ointment [16].

The used parts of *M. deserti* De Noé in the preparation of different remedies are summarized in Figure 4b. The obtained results revealed that the commonly used part was leaves (51.35%), followed by aerial part (20.27%), flowers (6.08%) and stems (5.41%) while 16.89% of informants used the whole plant. In addition, 41.91% of informants stated that the dried plant parts were used more frequently, followed by fresh parts (19.85%) and theremaining 38.24% were used in either fresh or in dried form of plant parts for remedial preparation (Figure 4c).

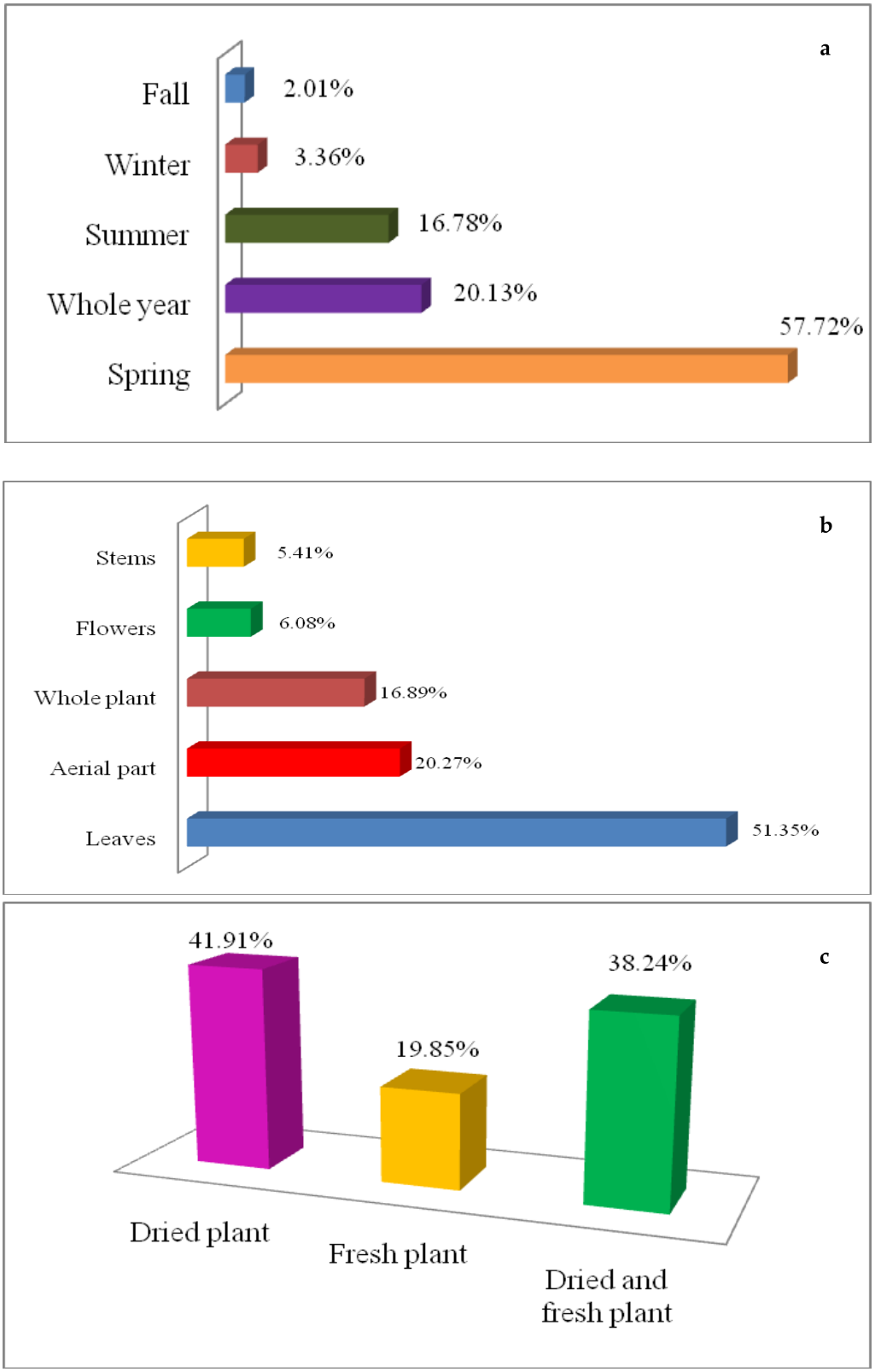

Figure 4. Harvest time (a), used part (b) and condition of preparation (c) of *M. deserti* De Noé

3.3.2. Preparation Mode and Routes of Administration

Various methods of plant material formulations are employed by the local population for preparing their treatments for different ailments (Figure 5a). Our results showed that infusion is the most common method of recipes preparation (33.16%) where plant parts were soaked in warm water and kept for a period in order to permit the release of active compounds, followed by decoction (25.91%) consisting of boiling plant materials in water. Plant materials were dried and grounded to powder and applied directly on the affected part (13.99%). For others, they mixed the powder with warm water and applied it as a body lotion (10.88%). The remaining 16.06% were applied as maceration, ointment (mixing the powder with honey or oil and applying on the wounded parts) or as inhalation forms (inhaling the aerial parts decoction smoke).

On the other hand, the local people of the studied areas used two types of route administration in which oral application is the dominant type (54.41%) followed by topical application (10.29%) and both oral and external application (35.29%) (Figure 5b). Skin injuries were usually treated locally with an ointment or compress. Baths were mostly used to treat dermatological disorders. Furthermore, the results of ethnobotanical survey results showed that the majority of *M. deserti* De Noé remedies in 58.82% of cases were prepared from combinations with other ingredients such as other plants (white wormwood, mint, rosemary and henna) or non-plant-adjuvants such as olive oil, honey, milk, sugar, yogurt, or eggs) and in 41.18% of cases, they were prepared alone without any additives.

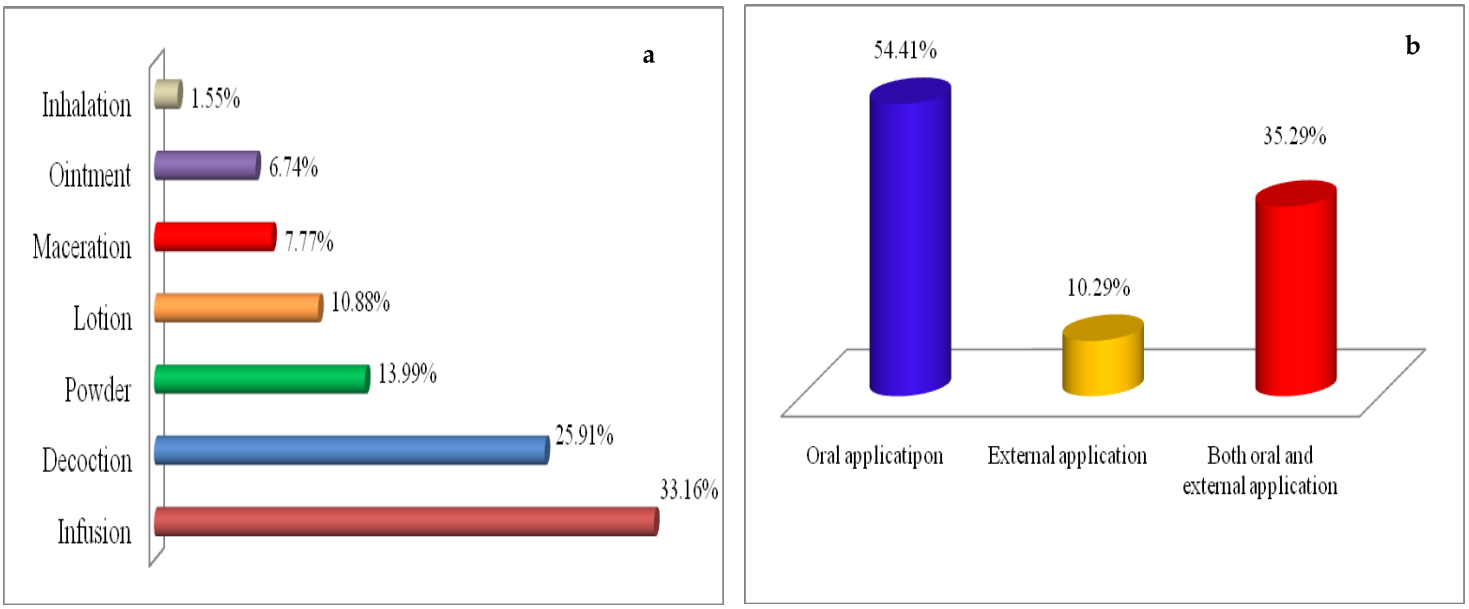

Figure 5. Different methods of *M. deserti* De Noé recipes preparation (a) and their routes administration (b) by local population

3.3.3. Dose, Frequency and Duration Use

With regard to the information collected about the preparation of herbal remedies, we noticed a dispute between informants on doses of certain *M. deserti* De Noé remedies prescribed with a high proportion of informants using these remedies with unspecified doses (75%), while only 25% of this population used it with specific doses. Furthermore, the results obtained showed that the duration and the frequency of *M. deserti* De Noé remedies use are variable according to the diseases treated, with a slight predominance until cure (25.74%), whereas the use for two weeks, one week and less than one week represented proportions of 25%, 23.53% and 20.59% respectively. In contrast, we found that the duration use for a month is less frequent (5.15%). In addition, these remedies and

preparations are often taken once daily (58%), following twice (36%) and three times per day (6%) (Figure 6).

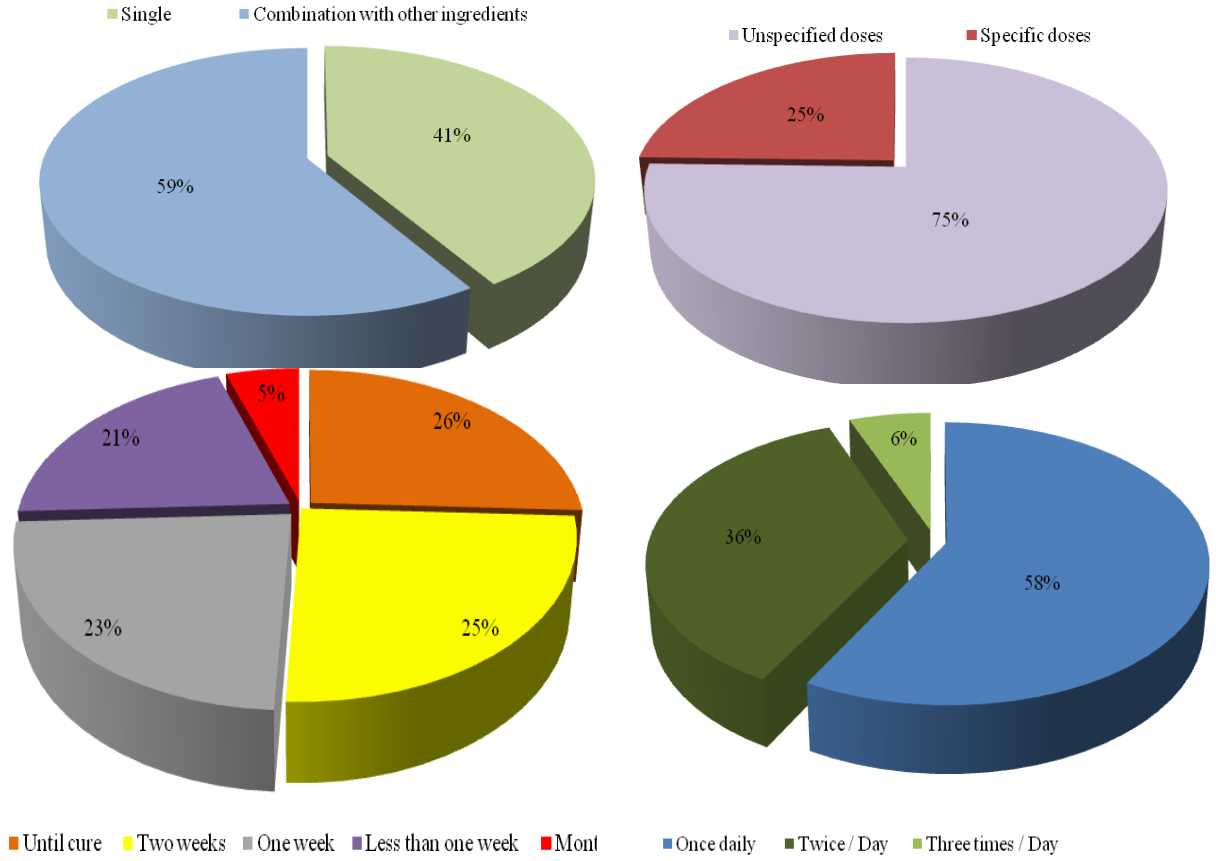

Figure 6. Dosage, frequency and duration use of *M. deserti* De Noé remedies

3.3.4. Ailment Treated

Regarding the treated ailments, *M. deserti* De Noé is reported to be used to treat more than one disease. According to our results, fever is the most commonly treated ailment bythis plant (27.61%), followed by gastrointestinal disorders (16.50%), various pains (13.47%) and diabetes (12.12%) (Figure 7). Other diseases as rheumatism, respiratory diseases, wounds, dermatoses, hemorrhoids, gynecological pathologies, cancers, weight loss and liver diseases were less frequent and represent low percentages.

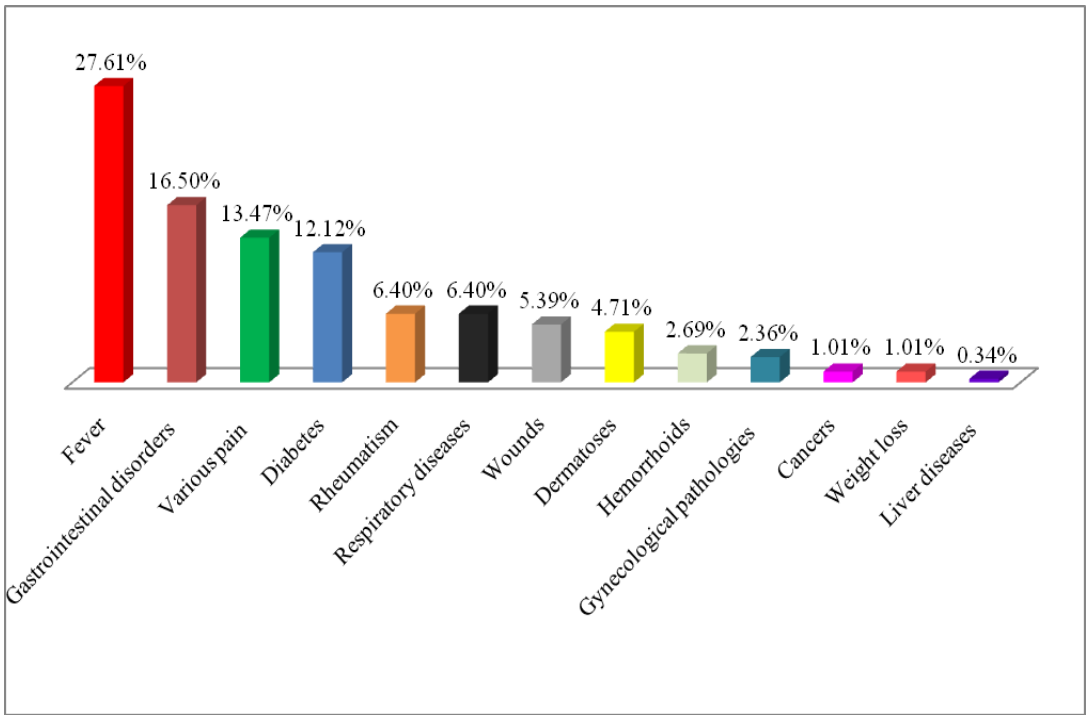

Figure 7. Ailments treated by *M. deserti* De Noé reported by local population of Biskraprovince

3.3.5. Toxicity and Adverse Effects of *M. deserti* De Noé Use

Concerning toxicity, the majority of informants (97%) reported the non-toxicity of M. *deserti* De Noé except a minority who reported possible risks of intoxication which is manifested by nausea, vomiting and diarrhea, as well as the prohibition of its use for the pregnant woman.

3. Discussion

In many countries around the world, the population is using conventional medicines. In fact, they are the basic health for a large portion of the world's population either by choice or absence of other options [17]. Indeed, our results showed that a high percentage(72%) of questioned residents in the studied areas preferred using traditional medicines. This is often because they are readily accessible, trusted and can be procured from withinthe community [18,19]. Also, as people are sometimes disappointed with modern medi- cal systems that can be expensive and cause different side effects and disappointing re- sults, people are using natural alternatives [20].

Population characteristics such as age, sex, education, and employment are important factors of knowledge [21]. Our results showed that both males and females practiced traditional medicine in the studied area with women being slightly more knowledgeable than men. Generally, women and men are equally responsible for the collection of me- dicinal plants. Women are habitually responsible for drying, storing and preparing reci- pes for the care of family members [22]. Indeed, women are the most holders of the tra- ditional knowledge where they share their responsibility as mothers and give first aid especially for their children [23]. In addition, our study showed that the elderly people (aged 41-90) have expectedly better knowledge on the use of medicinal plants like *M. deserti* De Noé as a result of their direct contact with nature. On the contrary, the young people showed less concern in these conventional methods mainly because of the non- recognition of traditional healers and accessibility to modern healthcare systems. Hence, the elderly people must provide and transmit their knowledge to the new gener- ation which may affect the continuity of indigenous knowledge [24,25].

The safety of herbal medicinal products has to be assured as it has a direct impact on humans. Thus, collection and conservation practices for medicinal plants are important as it represents the first step in quality assurance [26]. The harvest of medicinal plant parts can be practiced during the period where the plants synthesize their secondary metabolites [27]. For example, leaves can be harvested in the flowering period while bark can be gathered in spring or early summer. This last is due to the fact that separation of bark is easier as the cell wall is thin. Roots and rhizomes are in general harvested at the season where reserve food and phytoconstituents will be at high concentrations [28]. The obtained results showed that the best time for *M. deserti* De Noé harvest is spring. According to Tavhare Swagata and Nishteswar (2014) [29], many factors impact the production of secondary metabolites such as temperature, rainfall, duration of daylight, collection method as well as methods of processing and storage. In addition, the concentration of biologically active constituents can vary with the plant growth stage and development [30].

Our data point out the use of leaves by a majority of locals for the preparation of M. *deserti* De Noé remedies. It has been noticed that in spite of leaves, other different parts (aerial part, flowers, stems, and whole plant) are also used for these preparations. The preferences of leaves could be attributed to the facility of preparation, accessibility at the required time, the presence of medicinally active secondary metabolites and their accumulation in that part [31-33]. Our results are similar to the findings of [33-37] describing leaves as the most used medicinal plants part in medicinal recipes.

These medicinal plant parts can be used either fresh or in the dry state after various drying and storage operations. A high percentage of informants suggested that the dried plant parts were used more frequently in the studied areas. However, natural drying is an effective conservation method by avoiding contamination, increasing its lifespan and reducing its weight in order to facilitate its transport [38].

In the preparation of traditional herbal medicines, numerous standardized protocols depend in general on the used parts and the condition that is treated. The used methods include decoctions, infusions and macerations [39]. Generally, these preparations depend on the targeted active constituents. The results showed that the decoctions and infusions were the preparation modes that are usually used in the studied municipalities. According to Chehma and Djebbar (2008) [40] and Salhi *et al*. (2010) [41], infusions and decoction are among the most common medicinal preparations globally used for the reason that they can collect the maximum of active principles. This study reported that some of these prepared remedies are taken orally while others may be applied externally or in the combination with oral and topical routes. The herbal remedies administered orally are generally in infusion, decoction, powder or maceration forms while inhalation, lotion, ointment, compress are the main external practices that were used by the local population. Our results were in line with the studies of Boadu and Asase (2017) [42]. The administration route of herbal medicines could be associated with natural products exuded in the plant extracts and depending upon the problem. Furthermore, the components and preparation modes depended on the treated ailment in addition to a variety of factors like sociological, geographical and economical ones [43].

The dose, frequency and duration use of any herbal treatment are necessary recommended to optimize its effectiveness and minimize its side effects [44]. The collected information revealed that the doses used for *M. deserti* De Noé recipes are arbitrary which might cause negative effects on health because it says "no substance is a poison itself, it is the dose that makes the poison". However, the given doves to treat people depend on the age, physical and health conditions, diagnosis and individual experiences [45-46]. On the other hand, the obtained data revealed that a high proportion of informants use these recipes until care but it shouldn’t exceed more than two weeks of treatment. In addition, these remedies and preparations are often taken once daily. According to Teklehaymanot

and Giday (2007) [47], the treatment frequencies rely on the treated disease and its severity.

In regard to treated ailments, this work has listed a number of pathologies treated by M. deserti De Noé. Fever and gastrointestinal disorders were the predominant ailments treated by local populations using this plant. Similar results showed that the extracts of the studied plant possessed excellent antipyretic and antinociceptive effects [48,49].

Concerning toxicity, almost all informants reported the non-toxicity of *M. deserti* De Noé as a treatment. According to Zeggwagh *et al*. (2013) [50], the most harmful effects associated with the use of medicinal plants are not related to the plant itself, but to an error of identification, to involuntary contamination (by another plant, heavy metals, pathogenic micro-organisms or agrochemical residues), non-compliance with the appropriate dose or interaction with other active ingredients. The obtained results of this study support those reported previously by Saad *et al*. (2016) [51] and Saad and Ouafi, (2019) [48] whichshowed that the oral administration of the infusion extract of the studied plant did not show any sign of toxicity.

4. Conclusions

This work consisted of documenting the traditional uses of an Algerian endemic medicinal plant; *M. deserti* De Noé. The information collected from the local population of Biskra showed that this plant is used in the treatment of several diseases (fever, digestive pathologies and pain). This study showed also that, the local people especially the elderly of the studied area have better knowledge of medicinal plants while the young generation did not show any interest in traditional applications of medicinal plants. This might be due to the non-recognition of traditional healers in comparison with healthcare systems. Accordingly, this study emphasizes the documentation of the traditional knowledge and its conservation from disappearance or loss.

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