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## ETHNOBOTANICAL STUDY OF ASTERACEAE FROM EL KALA NATIONAL PARK (NORTH-EAST OF ALGERIA)

Amel Klech<sup>1\*</sup>, Lamia Boutabia<sup>1</sup> and Azzedine Chefrour<sup>2,3</sup>

<sup>1\*</sup>Laboratory Agriculture and Ecosystem Functioning, Faculty of Natural and Life Sciences, Chadli Bendjedid University, P.O. Box 73 (36000) El Tarf (Algeria).

<sup>2</sup>Laboratory Development and Control of Hospital Pharmaceutical Preparations, Faculty of Medicine, Badji Mokhtar University, P.O. Box 12 (23000) Annaba (Algeria).

<sup>3</sup>Department of Biology, Faculty of Natural and Life Sciences, Mohamed Cherif Messaadia University, (41000) Souk Ahras (Algeria).

\*Email: [frikamel3@gmail.com](mailto:frikamel3@gmail.com)

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### ABSTRACT

In order to promote the flora and the ethnobotanical heritage of Algeria, special attention was given to the Asteraceae family. An ethnobotanical survey was conducted among a representative sample of the rural population of El Kala National Park and a total of 360 survey forms have been completed. 20 species divided into 17 genera were listed; also, the study found that the treatment of diseases of the digestive tract is the most common (26.09%). In addition, the leaf is the most used organ (27.03%), and the decoction (29.33%) is the method of preparation most used for the majority of remedies. In the end, the most cited species are: *Matricaria chamomilla*, *Cynara cardunculus*, *Artemisia herba-alba*, *Cynara scolymus*, *Artemisia arborescens*, *Lactuca sativa*, *Helminthotheca echioides* and *Atractylis gummifera*.

**Keywords:** Asteraceae, Ethnobotanical survey, El Kala National Park (EKNP), northeastern of Algeria.

### Introduction

Algeria, by its biogeographical position, offers a very great ecosystem diversity which translates into a wide floristic diversity with about 4000 species and subspecies of vascular plants (Dobignard and Chatelain, 2010-2013). However, the Algerian medicinal flora remains unknown to this day, because of the few thousand plant species, only 146 are counted as medicinal (Baba Aissa, 2000). These species belong to several families including that of the Asteraceae recognized for its taxa, both spontaneous and cultivated.

Asteraceae is the largest botanical family of vascular plants in the world, with some 25,000 species divided into 1,500 genera (Stevens, 2018). They originate from the Middle Eocene and are dated to around 42-36 m.y. (Kim *et al.*, 2005), although more recent research dates back to the Late Cretaceous to Paleocene transition, approximately (74.4- 64.7 (-55.1) m.y. (Panero and Rozier, 2016).

In Algeria, several floristic studies have highlighted the diversity of different habitats of Asteraceae species, hence the interest in carrying out fundamental scientific research in the field of ethnobotany, traditional pharmacopoeia as well as natural substances.

It is with this in mind that this work was proposed to meet the need to identify, collect and organize oral information on medicinal plants belonging to the Asteraceae family, used in the past and still today, collected during an ethnobotanical survey among the rural population of El Kala

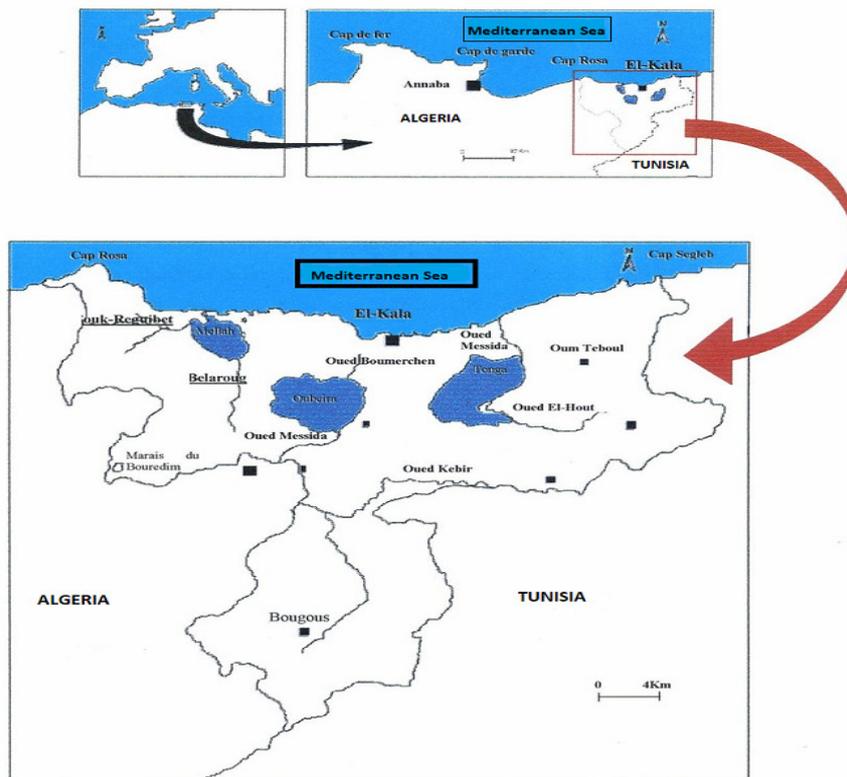
National Park (EKNP) (extreme northeastern Algeria). This protected area known for its significant flora richness, includes two important areas for plants: El Kala 1 (coastline and wetlands) with 94 threatened species and 20 endemic species and El Kala 2 (forests of the Medjerda Mountains) with 32 threatened species and 20 endemic species (Yahi *et al.*, 2012).

With the aim of carrying out a new and original work, this ethnobotanical study is proposed in order to collect all the information on the therapeutic and traditional local applications and to highlight the place of phytotherapy in the traditional system of care at the level of this region and constitute a very valuable source of information, ready to be exploited scientifically.

### Materials and Methods

#### Presentation of the study area

El Kala National Park, with an area of 76.438 ha, is located in the extreme northeast of Algeria with Lambert coordinates 36° 52 North latitudes and 8° 27 East longitudes. It is limited to the north by the Mediterranean Sea, to the south by the foothills of the Medjerda mountains, to the east by the Algerian-Tunisian border and to the west by the end of the alluvial plain of Annaba (Figure 1). The study area is part of El Tarf state known for its forest heritage and its humid to sub-humid Mediterranean climate with lime winter (Benyacoub *et al.*, 1998).



**Fig. 1 :** Location of El Kala National Park

**Study method**

Ethnobotanical surveys were carried out in the three sectors localities of El Kala National Park (Brabtia sector locality, Tonga sector locality and Bougous sector locality). A total of 360 people were interviewed, i.e. 120 people per sector locality.

An ethnobotanical survey form is submitted to

respondents during individual interviews. The data collection period spanned from January 2019 to February 2020. During each interview we collected all the information on the interviewee, including age, sex, level of education, family situation. the information collected on plants was based on knowledge of the botanical taxa, parts used, methods of preparation and therapeutic uses (Figure 2).

**ETHNOBOTANICAL SURVEY FORM**

**Profile of the Interviewee**

**Last and first name :** .....

**Age:**  [<20]  [20 - 40]  [40 - 60]  [60 - 80]  [80 - 90]

**Sex :**  Male  Feminine

**Family situation:**  Married  Single  Divorced  Widower

**Level of Study:**  Illiterate  E. primary  E. intermediate  E. secondary  E. university

**Locality :** .....

**Local (vernacular) name of the plant :** .....

**Part used (drug):**  Leaf  Flower  Fruit  Aerial part  Root

**Pharmaceutic forms:**  Infusion  Decoction  Powder  Fumigation  Poultice

**Diseases:**  Digestive diseases  Cardiovascular diseases  Respiratory diseases  
 Kidney diseases  Skin disorder  Liver diseases  Diabetes

**Other information:** .....

**Fig. 2 :** Ethnobotanical survey form

## Results and Discussion

### Floristic aspect

#### Medicinal Asteraceae taxa listed in the (EKNP)

According to the results presented in Table 1, twenty Asteraceae taxa have therapeutic properties and are relatively more used in traditional herbal medicine by the local population; the majority of these species grow spontaneously. These species belonging to 17 genera, of which *Cyanara* and

*Artemisia* are the most famous and used by the native populations of El Kala National Park.

In Algeria, according to the work of Arbia and Hamoudi (2017), 52 Asteraceae taxa with therapeutic interest have been identified, 32% of which exist at the EKNP level. It is important to mention that this list includes a significant number of species considered medicinal and of strong traditional use in eastern Morocco and eastern Andalusia (Spain) (Benítez *et al.*, 2021).

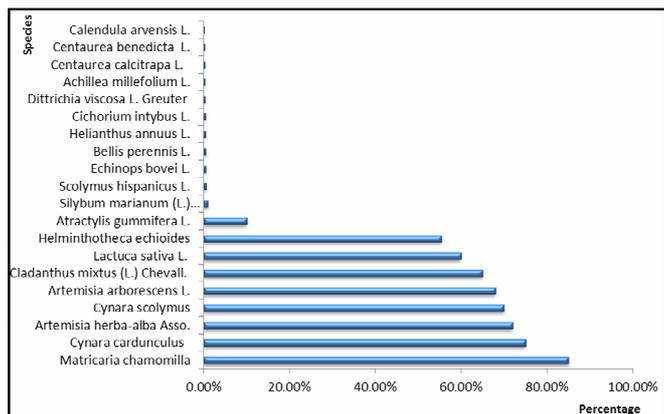
**Table 1 :** The species of Asteraceae for therapeutic use recognized in the El Kala National Park region

N°	Species	Vernacular name	Name in arab	Status	Part used	Diseases treated	Method of preparation
1	<i>Achillea millefolium</i> L.	Common yarrow	Akhilia	Spontaneous	Leaf, flowers	-Digestive -Dermatosis	Maceration, Infusion
2	<i>Artemisia arborescens</i> L.	Tree wormwood	Chadjrat Meriam	Cultivated	Stem, leaf	-Urogenital -Digestive -Metabolics	Powder, Decoction, Maceration
3	<i>Artemisia herba-alba</i> Asso	White wormwood	Chihe	Spontaneous	Stems, leaf, roots	-Digestive -Urogenitale -Metabolics	Whole plant, Powder, Maceration, Decoction, Infusion, Fumigation
4	<i>Atractylis gummifera</i> L.	Distaff thistle Stemless atractylis	Addad	Spontaneous	Roots	-Urogenital -Oral system disease and dental pain -Dermatosis	Infusion, Powder
5	<i>Bellis perennis</i> L.	Daisy	Ghedala, Zhar Rbiaae	Spontaneous	Stems, leaf, flowers	-Digestive	Decoction
6	<i>Calendula arvensis</i> L.	Marigold of the Fields	E'Djemaila	Spontaneous	Leaf	-Digestive -Dermatosis	Infusion
7	<i>Centaurea benedicta</i> L.	Blessed thistle, Holy thistle	Acifira, Khirria, Chouk el-djamel	Spontaneous	Flowers and Leaf	-Metabolics	Infusion
8	<i>Centaurea calcitrapa</i> L.	Red star-thistle Purple starthistle	Bouneggâr	Spontaneous	Flowers and Leaf	-Metabolics	Infusion
9	<i>Cichorium intybus</i> L.	Common chicory	Tilfaf, Seriss, Hendba	Spontaneous	Stem, flower, root	-Metabolics -Digestive system	Infusion, Decoction
10	<i>Cladanthus mixtus</i> (L.) Chevall.	Moroccan chamomile	Hellâla, Camomille du Gharb	Spontaneous	flowers , leaf , stems	-Digestive -Dermatosis	Decoction Fumigation
11	<i>Cynara cardunculus</i> L.	Artichoke thistle Cardoon	Khourchouf	Cultivated	Roots, stems, fruits and leaf	-Metabolics -Digestive tract	Decoction
12	<i>Cynara scolymus</i> L.	Artichoke thistle Cardoon	Garnoune	Cultivated	Flower head, roots, stems	-Metabolics -Digestive tract -Respiratory	Infusion, Powder, fresh consumption
13	<i>Dittrichia viscosa</i> L. Greuter	Yellow fleabane Sticky fleabane	Magramene	Spontaneous	Leaf	-Respiratory -Urogenital -Dermatology	Infusion, powder
14	<i>Echinops bovei</i> L.	Echinops	Taskra, Fouga El djemel, Kachir	Spontaneous	Roots	-Urogenital	Decoction
15	<i>Helianthus annus</i> L.	Common sunflower	Nouarat chms, abade chms	Cultivated	Leaf, roots, Seeds	-Metabolics	Powder Decoction
16	<i>Helminthotheca echioides</i> L.	Bristly False viperine	Elharcha	Spontaneous	Stem	-Digestive tract -Cardiovascular illnesses	Fresh consumption, Decoction
17	<i>Lactuca sativa</i> L.	Lettuce	Elkhas	Cultivated	Leaf	-Digestive	Decoction
18	<i>Matricaria chamomilla</i> L.	Chamomile	Elbaboundj	Spontaneous	Flowers	-Digestive - Oral system diseases and dental pain	Infusion, decoction, cataplasm, maceration, inhalation, fumigation, powder
19	<i>Scolymus hispanicus</i> L.	Common golden Thistle Spanish oyster Thistle	Zarnize	Spontaneous	Stems	-Metabolics -Digestive tract	fresh consumption
20	<i>Silybum marianum</i> (L.) Gaertner	Mary thistle, Mediterranean milk thistle	Boug	Spontaneous	Flowers	-Nervous system diseases -Metabolics	Decoction

**The most Asteraceae medicinal taxa used by the population**

The data collected shows that eight medicinal plants are the most used in different localities: *Matricaria chamomilla*, *Cynara cardunculus*, *Artemisia herba-alba*, *Cynara scolymus*, *Artemisia arborescens*, *Cladanthus mixtus*, *Lactuca sativa*, *Helminthotheca echioides* and *Atractylis gummifera* with respectively 85%, 75%, 72%, 70%, 68%, 65%, 60%, 55.4% and 10%.

The rest of the taxa, despite their abundance in the region, the frequencies of their uses by the population are very low and limited between 0.1 and 1 percent (Figure 3).



**Fig. 3 :** Medicinal Asteraceae taxa used by rural population of El Kala National Park

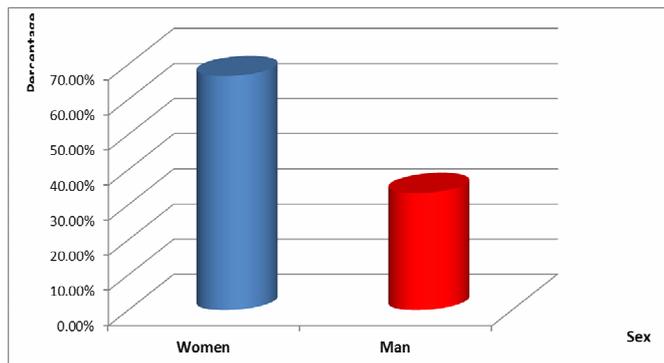
**Frequency of Medicinal Asteraceae uses**

**According to sex**

The results obtained show that the use of medicinal plants varies by sex. In fact, 66.67% of the women questioned turned to traditional medicine compared to 33.33% of the male population (Figure 4). This can be explained by the use of medicinal plants by women in fields other than conventional therapy and by their responsibility as mothers, they are the ones who give first aid in particular for their children (Mehdioui and Kahouadji, 2007; Belhaj *et al.*, 2020; El Hilah *et al.*, 2021).

Omwenga *et al.* (2015) asserted that couples have shared medical knowledge, with a slight advantage going to women. The same observation has been made by several researchers, for example Bouzid *et al.* (2017) and Boutabia *et al.* (2020) in their work carried out in Algeria.

They noted that women are holders of knowledge in the field of traditional herbal medicine, while men reserve the task of collecting plants in hilly areas and dangerous.

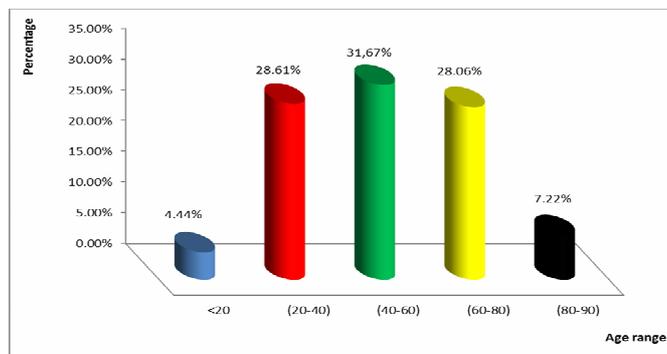


**Fig. 4 :** Frequency of plant uses by sex

**According to the age group**

The use of medicinal plants by the population of PNEK is widespread in all age groups, with a predominance in people aged 40 to 60 years and 20 to 40 years (31.67% and 28.06% respectively), and low in the 60 to 80 age group and those over 80 years old (7.22%). The old respondents as well as the youngest are not interested in the field of phytotherapy (Figure 5).

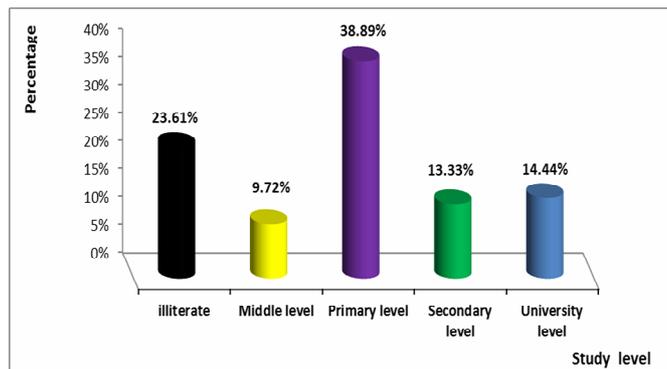
Knowledge of the properties and uses of medicinal plants is generally acquired through long experience accumulated and passed on from one generation to the next. The transmission of this knowledge is in danger today because it is not always assured. The results obtained show that people belonging to the age group of 40 to 60 years have more knowledge of medicinal plants compared to other categories. The elderly are however supposed to provide more reliable information because they hold a good part of the ancestral knowledge which is part of the oral tradition (Hsein and Kahouadji, 2007). The use of medicinal plants by older people has also been reported in other studies (Boutabia *et al.*, 2011; Lazli *et al.*, 2019; Gherairia, 2021).



**Fig. 5 :** Use of medicinal plants by the rural population according to age

**Level of study**

The majority of the users of medicinal plants have the primary level, with a percentage of 38.89%, while those who have no pedagogical training appointed in our society by the illiterate represent a high percentage (23.61%) among the people having recourse to the use of medicinal plants to treat their discomforts. These results agree with those of Birendra and coll. (2015). Educated people with university level have a percentage of 14.44%; while people with secondary education participate with a low rate of around 13.33%. The last position is occupied by people with an average level of education (9.72% ).



**Fig. 6 :** Use of medicinal plants by the rural population depending on the level of study

### Distribution of respondents according to the source of information

More than half of the respondents (55%) provide information on medicinal plants either from family members or from their neighbor friends and colleagues who have knowledge of the therapeutic virtues of plants in a traditional and empirical way. While forty-one percent get what they want from plant vendors and traditional healers. The lowest percentage (4%) is attributed to members of the medical profession (doctor, pharmacist, dentist, paramedical staff) (Figure 7). These results agree with those obtained by Belhaj *et al.* (2020).

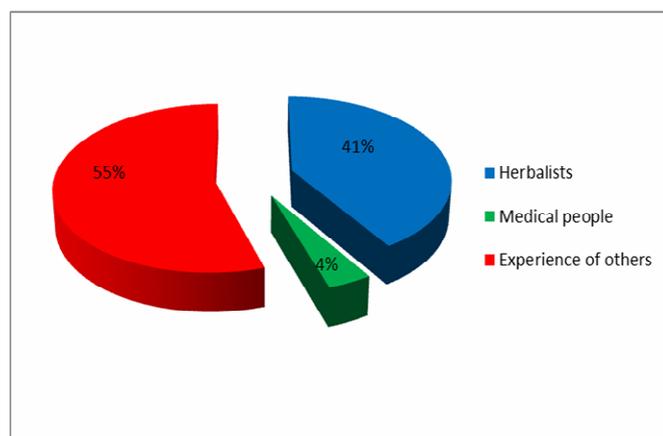


Fig. 7 : Source of the information

### According to the part of the plant used

The drug most used by the population was the leaves of all plant species with a rate of 29.33%, followed by the other parts (flowers, roots and stems) with different proportions which are respectively 23.34%, 21% and 19.32%. All seeds, fruits, hold a cumulative percentage of 6.99% (Figure 8). These results are in agreement with those obtained by Derridj *et al.* (2010); Boutabia *et al.* (2011); Boughrara and Legseir (2016); Bouasla and Bouasla (2017); Hamel *et al.* (2018).

The high frequency of leaf use can be explained by the ease and speed of harvesting (Bitsindou, 1996) but also by the fact that they are the site of photosynthesis and sometimes the storage of secondary metabolites responsible for the biological properties of the plant (Bigendako-Polygenis and Lejoly, 1990; Imran *et al.*, 2014; Rahayu *et al.*, 2021b).

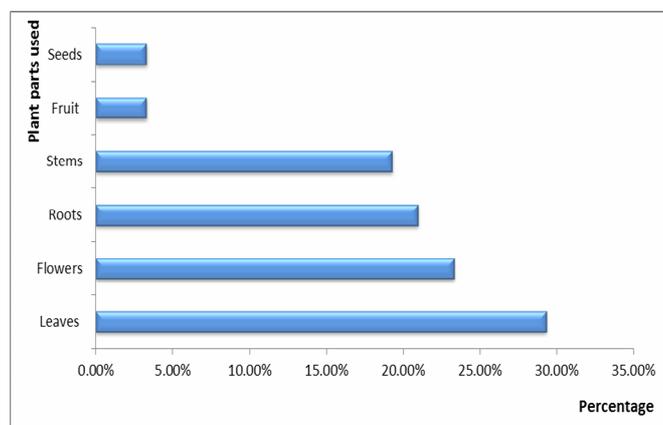


Fig. 8 : Frequencies of use of different medicinal plants parts by the population of EKNP

### Mode of uses

In herbal medicine, there are several methods of preparing herbal teas. Decoction is the most widely used method of preparation by the population of El Kala National Park with 27.03%, followed by infusion with 18.92%. The use in powder form, consumption without preparation and maceration are represented by 16.22%, 13.51% and 10.81% respectively. The different parts of medicinal plants are also used in the form of inhalation, fumigation and poultice with 12.88% for each one (Figure 9).

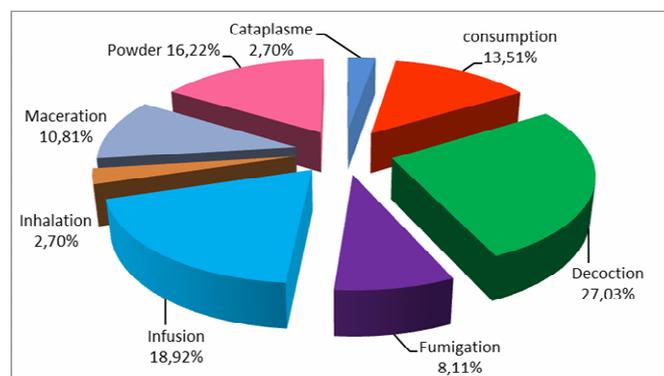


Fig. 9 : Frequency of preparation methods by the rural population of EKNP

The results obtained show that the method of use most used by the rural population is the decoction, which agrees with those of Lahsissene and Kahouadji (2010) who find it adequate to warm the body and eliminate the microorganisms present on the plant drug. For his part, Salhi *et al.* (2010) indicate that the decoction collects the most active ingredients and attenuates or cancels the toxic effect of certain recipes.

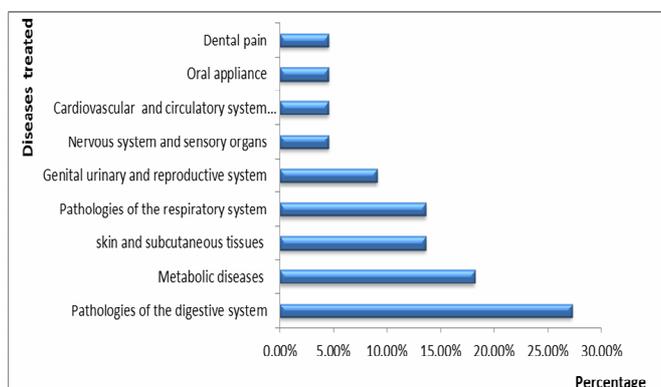
Moreover, in Algeria, the results obtained relating to the modes of use of the plants listed are identical to those obtained by Aouadi (2021) and Lazli *et al.* (2019) at the level of the El Kala region of the wilaya of El Tarf. They are also consistent with the results of work carried out in other regions at the national and international level (Benkhniqie *et al.*, 2010-2011; Tahri *et al.*, 2012; Bouzid *et al.*, 2017; Bouasla and Bouasla, 2017; Hadjadj *et al.*, 2019; Belhaj *et al.*, 2020; Rahayu *et al.*, 2021a).

### Diseases Treated

The ethnobotanical analysis of the information collected in the field has identified a number of diseases treated by medicinal plants belonging to the Asteraceae family. The results show (figure 10) that the majority of plants listed through the surveys are mainly used in the treatment of diseases of the digestive system (27,27%), metabolic disorders (18,18%), diseases dermatological and respiratory diseases with the same percentage 13.64%. Urogenital, circulatory, oral and nervous system diseases have a more or less low percentage of 4.55% and 9.09%.

In Algeria, these results agree with those obtained by Chermat and Gharzouli (2015); Boughrara and Legseir (2016), Bouasla and Bouasla (2017); Hamel *et al.* (2018), Lazli *et al.* (2019) and Bouhouia (2021). In Morocco, they agree with those of Salhi *et al.* (2010); Lahsissene and Kahouadji (2010); Hseini *et al.*, 2011; Tahri *et al.*, 2012; Rhattas *et al.*, 2016; Belhaj *et al.*, 2020 and in Tunisia, with those of Jdaidi and Hasnaoui (2016).

The use of Asteraceae species overlap between our studied territory (Algeria) and that of eastern Andalusia (Spain) and eastern Morocco (Benítez *et al.*, 2021). The coincidence of current ethnobotanical knowledge for Asteraceae in the three studied localities is high, since the uses of the taxa concerned are practiced in the same way in the three localities.



**Fig. 10 :** Frequencies of diseases treated with Asteraceae in the study area

### Conclusion

This study allowed us to reveal the relative importance given to *Asteraceae* taxa in traditional herbal medicine in the health system. The collection and analysis of the data collected helps to preserve local popular knowledge in the region of El Kala National Park.

In addition, the severe exploitation regime may place these species in the category of rare or extinct species, alien to future generations. Therefore, the cultivation, domestication and valuation of medicinal plants, as well as the rationalization of the harvest of spontaneous plants are necessary in order to preserve and reduce the pressure on the medicinal plants most used in the health field.

From an ethnobotanical and pharmacological point of view, the leaves constitute the favored part of local users. Likewise, a decoction is the most widely used form. Of all the diseases treated, digestive disorders are the most cited, followed by urogenital problems and skin infections.

The diversity of therapies identified in the study area provided us with unprecedented information and constitutes a real cultural wealth. This is why the present results could serve as a basis for new bioactive molecules with therapeutic potential which will make it possible to orient and guide pharmacological research.

### Acknowledgements

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