

Transmission of Ethnoecological and Ethnobotanical Knowledge of Some Toxic Wild Plants in Northwestern Tunisia (Community of Ouled Sedra): What Effects on the Health of Animals and Humans?

Jdaidi Nouri*,
Aloui Foued, Selmi Houcine,
Hasnaoui Foued and
Chaabane Abbees

Sylvo-Pastoral Institute of Tabarka,
University of Jendouba, Tunisia

*Corresponding author: Jdaidi Nouri

✉ jdaidi.nouri25@gmail.com

Sylvo-Pastoral Institute of Tabarka University
of Jendouba, Tunisia.

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Abstract

The entire local population in northwestern Tunisia uses traditional medicine to solve their health problems. In the present work, a study on the ethnobotanical and ethno ecological aspect was carried out according to a stratified and random sampling at the level of 4 stations of the region of Ouled Sedra. Ten toxic species belonging to 8 families were inventoried during this study.

The results obtained showed that the elderly 53%, women 65%, illiterates 44% and herbalists 45% have a very high level of knowledge about the identified species. In addition, poisonings are generally accidental 75% and caused by the resemblance of the leaves of different plants leading to confusion. The use of these plants causes digestive disorders 28% and kidney problems 21%.

The investigations carried out for the present study made it possible to collect a great deal of information on poisoning by plants. It would be desirable to use them to train professionals.

Keywords: Toxic plants; Ethnobotanical survey; Ethnoecological study; Ouled Sedra

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Introduction

The relationship between humans and plants has become more and more intimate and very diverse, such as the satisfaction of nutritional (food, condiments, drinks), aromatic (perfume), medicinal and ornamental needs. However, the personnel working in emergencies, doctors in particular, do not receive any training in botany, which creates a deficit of certain basic concepts essential to the identification of plants. Certain serious poisonings are therefore difficult to manage, unlike other types of toxicants. Poisonous or poisonous plants are plant species which contain all or part of dangerous substances mainly for humans but also for animals [1,2]. Children are the most affected because they are attracted to the colorful berries and houseplants left within their reach; according to Rjasperson-Schib, 85% of cases occur in children under the age of 11. The other cases, classified as classics of poisoning, correspond to walkers and amateur botanists who confuse the leaf, berry or root of a poisonous plant with an edible variety [3].

However, their incrimination in cases of animal mortalities is difficult to establish with certainty. It is often difficult to make a diagnosis of plant poisoning especially as it is an easily advanced argument by breeders during unclear pathologies. Botanical knowledge, especially veterinarians, is often insufficient to allow them to identify the suspected plant [4]. The Tunisian flora includes 2,162 species, including 2,103 species divided into 115 families and 742 general appear in the three volumes of the Flora of Tunisia currently in use. Some identified species are toxic to both humans and livestock [5].

According to Zetlaluoi and Lenoble, the toxicity of plants also varies with the season, the nature of the soil and climatic conditions. The risks of poisoning vary with the parts of the plant. Some plants are poisonous to humans, not animals [6].

Very little bibliographic data and research work are available on the main toxicants in Tunisia.

This work was set for the objective of identifying the floristic,

ethnoecological and ethnobotanical knowledge of the various toxic species in the region of Ouled Sedra [6].

Materials and Methods

Experimental setting

The study was carried out at the level in the region of Ouled Sedra (N36°46'13 "E008°46'36") in the north-west of Tunisia. Our study area constitutes a remarkable center of biodiversity, particularly in terms of forest and shrub formations.

This region is characterized by a humid bioclimate, an upper under-stage with a warm winter, with an average annual rainfall of over 1500 mm/year and an average annual temperature of 14.9°C.

The forest domain covers more than 75% of the total area of the municipality. The plant cover is dominated by the strong presence of cork oak and Zen oak.

Conduct of the investigation

The present study was carried out in 4 stations (Gzailiya, Abadliya, Zarga and Ain Saida) representative of the region of Ouled Sedra. The study sample consisted of 400 respondents, who meet the main characteristics of the local population. Based on stratified random sampling, samples of 100 people were taken for each station. Data collection took place from the 9th of April 2019 to 9th of April 2020.

We collected all the information on the toxic plants in the study area known to the respondents according to age, sex, cultural level, the organs involved and intoxication.

Floristic study

In parallel with the surveys carried out among the local population, we carried out floristic surveys to identify the various toxic plants in the region of Ouled Sedra. Sampling was carried out according to the principle of minimum air 100 m² when the tree layer was dominant and 25 m² when the shrub layer was dominant. XLSTAT version 2020 software was used to analyze the statistical data.

Results and Discussions

Floristic aspect

Identification of the main families: Ten toxic species belonging to 8 families were identified by studying the floristic records in the study area (**Table 1**). The families represented in the region are *Apocynaceae*, *Araceae*, *Asteraceae*, *Apiaceae*, *Solanaceae*, *Zygophyllaceae*, *Rhamnaceae* and *Rutaceae*.

Frequencies of the most identified toxic species: Analysis of the information collected shows that 4 toxic species are the best known by the local population (**Figure 1**). *Nerium oleander* species, *Alocasia macrorrhizos*, *Carlina gummifera* and *Conium maculatum* are the most represented with respectively 95%, 70%, 53% and 50% followed by *Rhamnus alaternus*, *Peganum harmala*, *Datura stramonium* and *Thapsia garganica* with respectively 29%, 25%, 15% and 10%. *Hyoscyamus albus* 5% and *Ruta graveolens* 3% are the least known by the individuals surveyed.

Transmission of ethnoecological knowledge by age group, sex, intellectual level and profession: The processing of statistical data has allowed us that the transmission of information on the knowledge of toxic wild plants in the study area varies with age, respondents aged over 65 have significant knowledge of these plants 53%, followed by the age groups 45-65, 25-45 with 23% and 20% respectively and finally that of the under 25 is 4% (**Figure 2a**). The results obtained show that 76% of the elderly (>45 years old) have more knowledge of toxic plants compared to other age groups. (**Figure 2b**) shows that more than half of the professionals surveyed are women 65% against men 35%.

Reading (**Figure 2c**) gives the distribution of knowledge of poisonous plants according to intellectual level. The majority 44% of respondents are illiterate, 35% of people have a secondary education level while 21% have a university education level.

Regarding the profession, herbalists 45%, farmers 40% have the most important level of knowledge about poisonous plants, followed by students 9% and other professions 6% (**Figure 2d**).

Transmission of ethnobotanical knowledge according to the circumstances of use, the nature of the confusion, the organs used and the clinical signs: Reading (**Figure 3a**) shows that 75%

Table 1: Identification of toxic plants with their scientific names, Arabic and French names and corresponding families

Scientific name	Arabic name	French name	Toxic organs	Family
<i>Nerium oleander</i> L.	Defla	Oleander	All the organs are poisonous and especially the leaves.	<i>Apocynaceae</i>
<i>Conium maculatum</i> L.	Dayl gat	Great Hemlock	All the organs are poisonous and especially the root.	<i>Apiaceae</i>
<i>Peganum harmala</i> L.	Harmel	Harmel	All organs are toxic and especially the seed.	<i>Zygophyllaceae</i>
<i>Hyoscyamus albus</i> L.	Hebbala	White henbane	All organs are toxic and especially the seed.	<i>Solanaceae</i>
<i>Rhamnus alaternus</i> L.	Melelis	Alaterne	Ripe fruits and bark (of the plant)	<i>Rhamnaceae</i>
<i>Thapsia garganica</i> L.	Dreyes or bounaffa	False fennel or Thapsia	All the organs are poisonous and especially the root.	<i>Apiaceae</i>
<i>Ruta graveolens</i> L.	Figel	Foul street	All the organs are poisonous and especially the leaves.	<i>Rutaceae</i>
<i>Datura stramonium</i> L.	Msikra	Sorcerer's Grass or Mole Grass	All organs are toxic and especially the seed.	<i>Solanaceae</i>
<i>Alocasia macrorrhizos</i> L.	Elephant ear	African mask	All organs are toxic and especially the stem and leaves.	<i>Araceae</i>
<i>Carlina gummifera</i> L.	Addad	Glue thistle	All organs are toxic and especially the rhizome.	<i>Asteraceae</i>

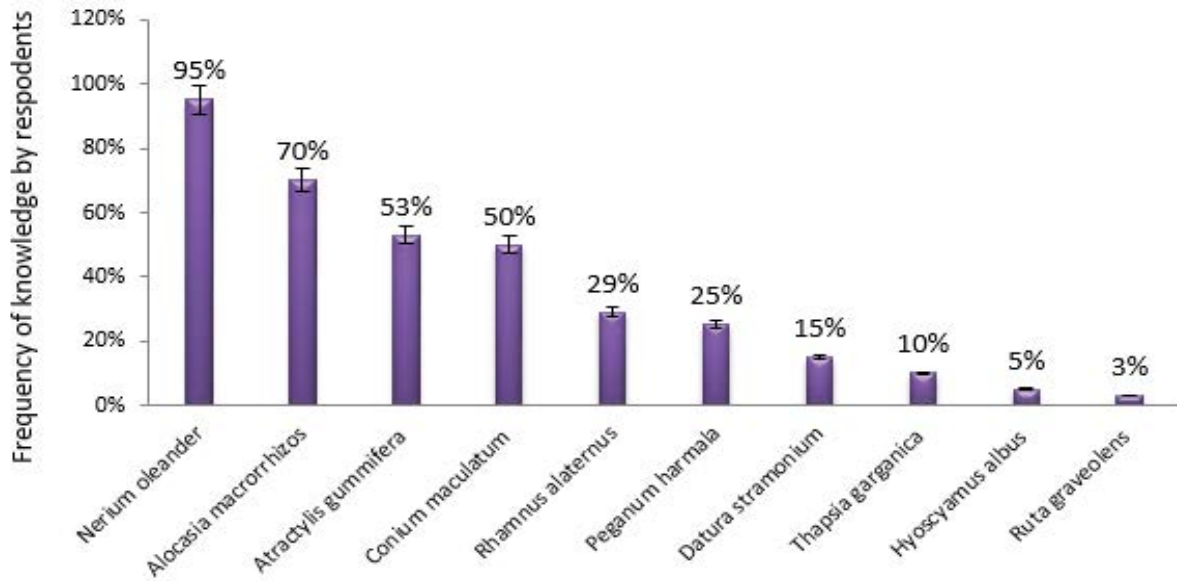


Figure 1: Frequency of knowledge of toxic species by respondents.

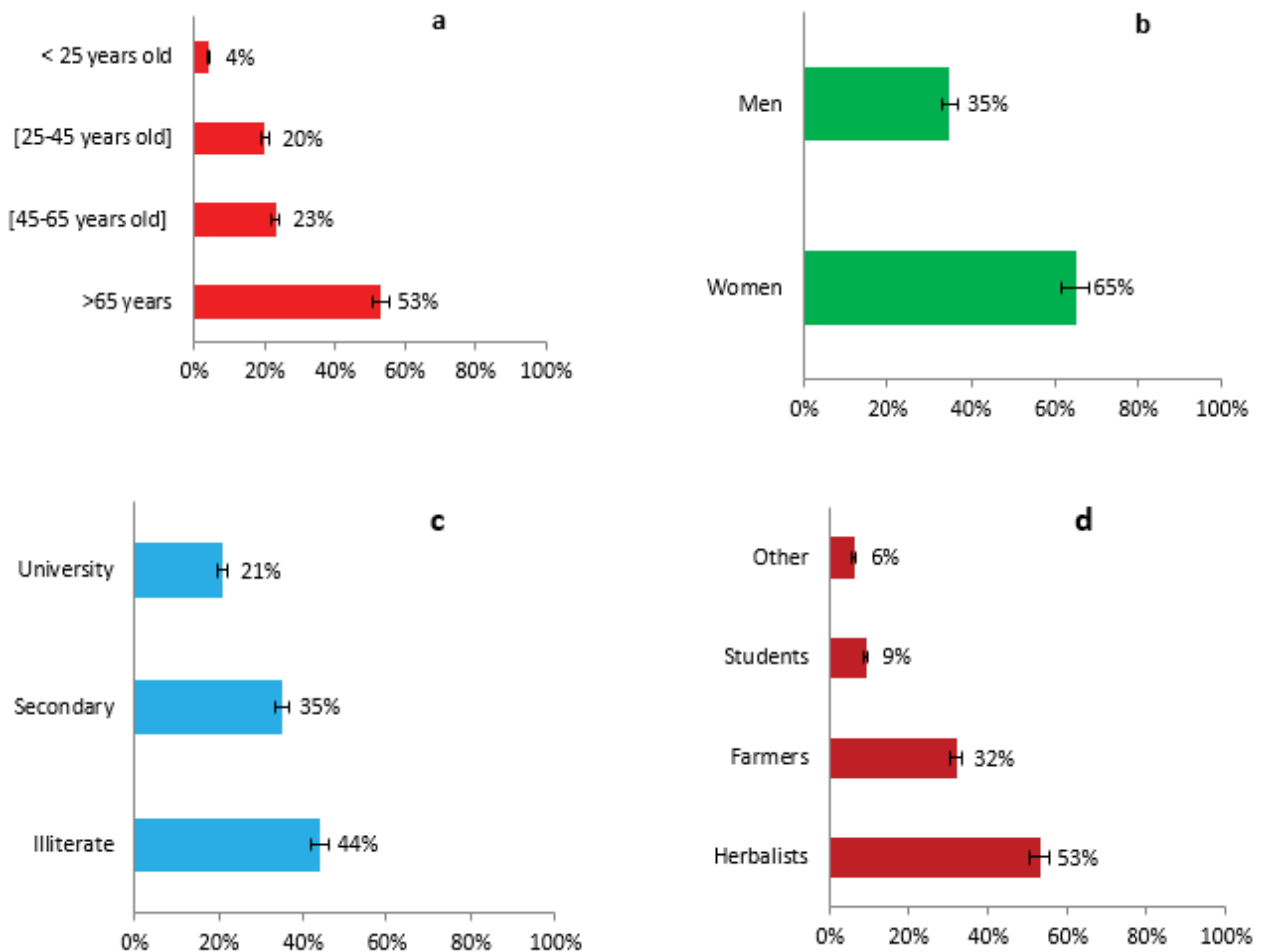


Figure 2: (a): Distribution of ethnoecological knowledge of poisonous plants according to age, (b): Sex, (c): Intellectual level and (d): Profession.

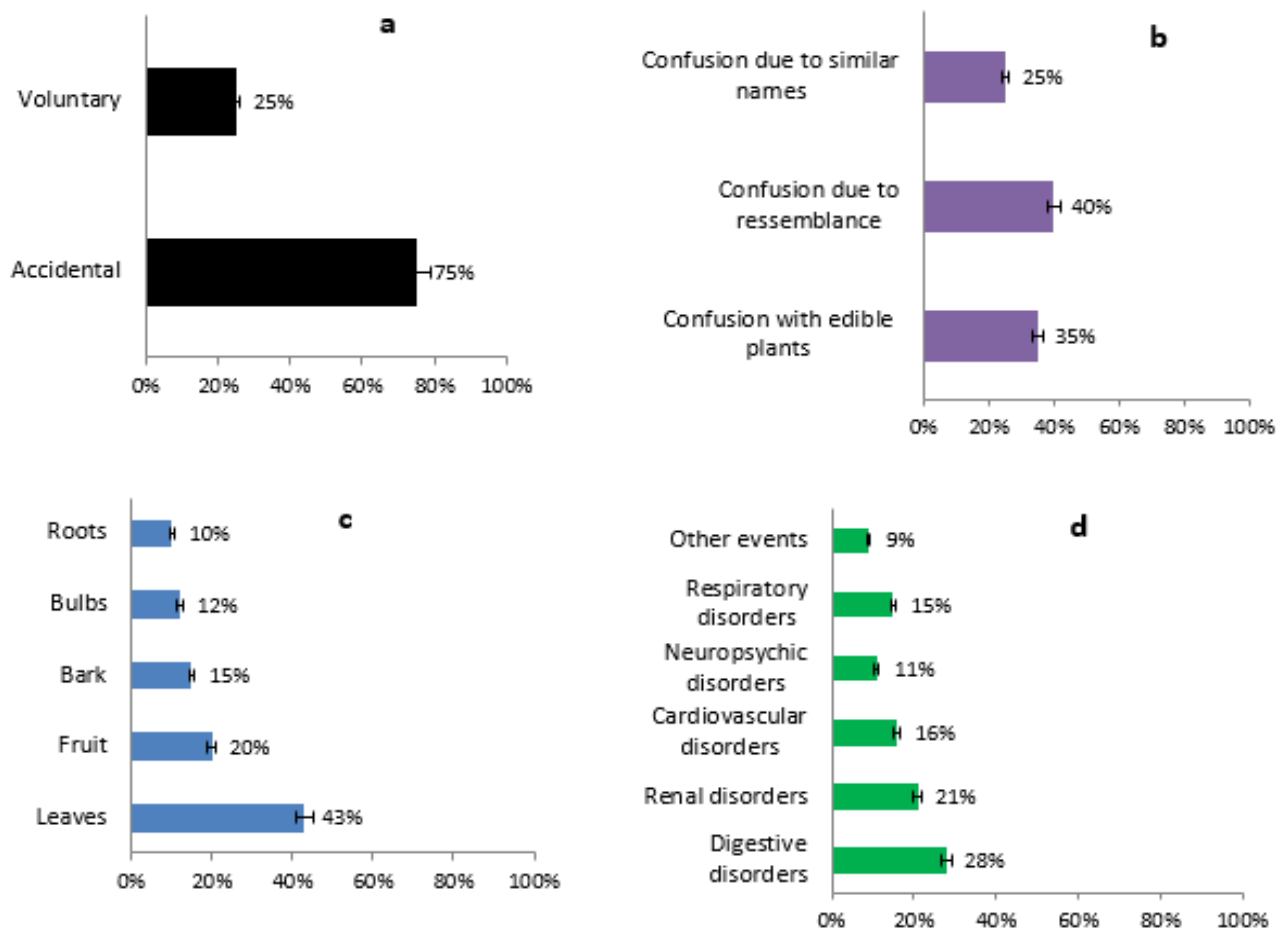


Figure 3: (a): Transmission of ethnobotanical knowledge according to the circumstances, (b): The nature of the confusion, (c): The organs used and (d): The clinical signs.

of poisonings are accidental in food use or following therapeutic use of certain medicinal plants. On the other hand, 25% of people have shown that poisoning is voluntary in the event of an attempted abortion.

Most of the people surveyed 40% have confusion because of the similarity between the plants confused at the level of the leaves against 25% have confusion because of the neighboring names. In addition, 35% of users confused edible plants with other toxicants (Figure 3b).

(Figure 3c) shows the different organs of plants with a view to toxicity level. It emerges from this figure that the leaves are the most toxic 43%, followed respectively by fruits 20%, barks 15%, bulbs 12% and roots 10%. This work, which contributes to a better knowledge of the consequences of the use of toxic plants in the region of Ouled Sedra (Figure 3d). The results obtained show that the use of most plants causes digestive disorders 28%, renal disorders 21%, cardiovascular disorders 16%, neuropsychic disorders 11%, respiratory disorders 15% and other manifestations 9%.

Depending on the results obtained, *Conium maculatum* (hemlock) is not poisonous in the same way for all animals, it loses its toxicity

when dried, the root contains less alkaloid than the fruits, and the toxicity is optimal in the spring. Most investigators have shown the existence of confusion between *Conium maculatum* and the wild carrot which, for its part, has a hairy stem without purple markings and does not include clustered flowers and a possible confusion of its root with parsnip, the turnip, celery and parsley.

The results obtained have shown that the use of fresh roots and fruits act directly on the nervous system and lead to paralysis of the respiratory muscles in humans.

All the organs of *Conium maculatum* L. are toxic, but especially the root, ingested by confusion with other food plants (turnip, carrot). Poisoning is rare. They are intentional or accidental. After two hours of ingestion, it causes digestive disorders and neurological disorders [7]. Analysis of the data shows the existence of confusion between *Carlina gummifera* and the non-toxic carline for all investigators. The underground part of *Carlina gummifera*, which is potentially fatal, contains substances that inhibit cellular respiration.

Studies have been carried out in Morocco on this problem of poisoning by Rhallem and Hami, they showed that Glue Thistle (*Carlina gummifera*), known in Morocco as Addad, is a very toxic

plant. It is the main cause of death from poisoning by plants in Morocco. Most poisonings are accidental [8,9]. The victims of poisoning are mainly children from rural areas, who confuse the root with other edible plants, such as the wild artichoke (*Scolymus hispanicus*). Leaves are generally the cause of poisoning in children who chew them but they can also be the cause of food confusion [10]. The fruits and seeds of poisonous plants can, in case of heavy consumption, cause respiratory and cardiovascular disorders, an alteration of consciousness which can progress to coma, or even death. Couplon have shown that the use of glue thistle allows kidney problems, hepatic disorders, cardiovascular disorders and respiratory disorders [11].

The people investigated showed that oleander (*Nerium Oleander*) is a poisonous species in all parts. The absorption of leaves, flowers or fruits causes digestive disorders and impairs the functioning of the heart. Herbivorous animals can also be poisoned with fresh oleander leaves. Some investigators have shown that the water in which the leaves or branches of oleander have steeped is also toxic to animals.

Our results agree with those obtained by Boustié and Isil, all the oleander organs are toxic and especially the leaves. Poisoning is accidental in children by consumption of leaves, flowers and seeds or voluntary poisoning in adults. The toxic effects of this species are digestive disturbances, neurological disturbances and cardiac signs [12].

All investigators have shown that *Peganum harmala* is very toxic to animals and humans. Ingestion of the plant causes intestinal toxicity [13].

According to Tahri, *Peganum harmala* is very toxic via an alkaloid, the level of which is higher in the seed 4%. The alkaloid content increases in summer, during the ripening phase of the fruit [14]. The use of this species makes it possible to cause abdominal pain, respiratory disorders and arterial hypertension. Abassi have shown that the toxicity process of *Peganum harmala* is especially important by ingestion of the plant, the toxicity is mainly intestinal. The active substances of this species attack the intestinal abdominal cells which can no longer fulfill their role hence protein and lipid deficiency is death of the animal [15].

Analysis of the data shows that *Rhamnus alaternus* L. is toxic to humans and animals. The leaves of this species cause an effect on the evolution of the body weight of animals.

Rhamnus alaternus L. is a medicinal plant, but the fruits are poisonous. Ingestion of the fruit causes vomiting, spasms and convulsions [16].

The totality of the data collected from the surveys shows that the sap of *Alocasia macrorrhizos* causes allergic reactions when it comes into contact with the skin. Ingestion of the plant can cause stomach upset in men. *Thapsia garganica* is very toxic by the rapid appearance of acute urticaria, angioedema-type sweat and genital washing. *Ruta graveoleus* is oral toxic causing gastrointestinal inflammation, dizziness, migraines, vomiting and diarrhea.

Conclusion

More than half of the Tunisian forest population uses medicinal plants as a source of personal care. Paradoxically, in Tunisia several of these species with medicinal properties are at the origin of toxicities. Thus, the present work was carried out with the aim of strengthening the botanical knowledge of the medicinal products used. The ethnobotanical survey carried out among the respondents showed that the botanical knowledge of toxic plants of women, the elderly (>65 years old), the illiterate, and herbalists is very important compared to other categories. Our results have allowed us to conclude that most poisonings by these plant species are accidental and due to resemblance or confusion with edible plants. Thus, leaves and fruits are the most toxic organs.

These results constitute a database for further studies aimed at strengthening knowledge about poisonous plants and conducting studies on the toxic aspects of medicinal plants in collaboration with scientific and medical research centers.

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