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Review Article

A field Exploration and Inventory of the Most Toxic Plants of Southern Flora Tunisian

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ABSTRACT

In the present work, a bibliographical survey of the toxicity of some plants of the southern Tunisia's flora was conducted on several methanoic extracts from miscellaneous toxic plants of the southern Tunisian flora and chosen from among the most used plants in traditional medicine. In Tunisia, a host of extracts from about twenty plants have shown spasmolytic properties, while several extracts from some plants showed a high toxicity and 3 extracts from 2 plants proved curative properties. In this article, we present about ten poisonous plants, classified in alphabetical order of the vernacular name, for which severe poisoning, even fatal, have been reported. It mainly consists in plants with cardiac and/or neurological toxicity. Following a succinct description of the plant, we approach the clinical, therapeutic and analytical aspects.

Keywords: Tunisian flora, Plants, Toxic, Phytotherapy, Alkaloids, Antidote.

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INTRODUCTION

In Tunisia, plants occupy an important place in traditional medicine, which itself is widely used in diverse fields of health.[1] Herbal remedies are considered cheaper with no side effects. In addition, these therapies tend to be more used in chronic diseases such as diabetes,[1,2] rheumatism[3] (chronic pain) and cancer.[4,5] The accurate identification of plants is necessary, as it is ensures the safe use of medicinal plants. Many people believe that these are natural and traditional products, therefore they are deemed safe, so there is no risk of harm. It is easier to pick the plants or buy them from herbalists and traditional healers, either in their raw forms or in the form of preparations. Generally, most of these toxic plants only cause mild transient skin, digestive, or general disorders. However, some are capable of causing severe intoxication, and in some cases, even death, even when absorbed in small quantities.[6] These customary practices can cause undesirable reactions or even poisoning, even at infinitesimal doses. This risk can be potentially higher with the combined and inappropriate handling of other drugs.[7] The present work focus on the "toxic" plants sold by some herbalists in selected regions in southern Tunisia (Tataouine, Medenine, and Gabes-Toujene) and the risks faced by people who handle these drugs without realizing it. The manuscript cover the analysis of survey results, particularly a monograph of the plants used in our survey and describe a prospective study conducted over a few months to establish a preliminary directory comprising a few indicative toxic plants from the flora of southern Tunisia to enable rapid identification in case of intoxication and facilitate more effective and prompt management in hospital emergency departments.

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MATERIALS AND METHODS

The survey was carried out of southern Tunisia in Medenine, Gabes, and Tataouine, among a few traditional herbalists who work with medicinal plants, as well as several shepherds and elderly individuals with a significant level of experience in these regions. The geographical map shows the surveyed regions indicated by circles in the pictorial abstract.

After interviewing the individuals, the herbalist would prescribe a therapy based on the reported and observed symptoms. Several variables were collected on an individual exploitation sheet, including identity, age and gender, reason for consultation, suspected diagnosis and proposed treatment with its mode of administration, dosage, duration, and cost. In this survey, we gathered as much information as possible about the plants in each targeted region. The informants were well-known and reputable individuals in these regions in the field of "traditional medicine with plants" or as "herbalists," or they were experienced individuals recognized for their practical knowledge of plant usage, most of whom were shepherds. The information collected in our questionnaire primarily focuses on plant materials, including the plant's name, botanical characteristics, traditional use of these plants, the part used (drope), harvesting season, contraindications and toxicity.

Simultaneously, a field survey was conducted in the Tataouine, Medenine, and Gabes regions. This survey involved interviewing local people, especially the elderly and shepherds, to identify the plants in the region and gather their theoretical and practical knowledge about the usefulness and toxicity of these plants. This field survey was complemented by an extensive monographic study to further investigate the toxicity of these plants (Document of the supplemental materials).

The survey of these regions reveals an impressive diversity of flora in southern Tunisia. The toxic plants within this flora are more or less known by the herbalists or shepherds in these regions.

Limitations of the Survey

The work conducted in these sometimes-remote regions, far from any convenience, was indeed quite limited, both in terms of time and the type of terrain explored, which was generally relatively close to roads accessible by conventional means of transportation. However, the reliability of these explorations remains reasonable since the vegetation in the region does not change significantly over considerable distances as confirmed by the Regional Agricultural Development Commissions (CRDA) of Tataouine, Medenine and Gabes, as well as by the individuals who responded to the questionnaire or the herbalists familiar with these regions.

RESULTS AND DISCUSSION

Based on the questionnaires, it can be observe the importance of medicinal plants in the treatment of human diseases and everyday ailments. The use of medicinal plants was motivated by economic and cultural reasons. Medicinal plants are provided by nature and readily available in the surrounding areas, making them less expensive than conventional medicines. The knowledge of plants and their healing abilities is a human legacy that was passed down from generation to generation, accumulated through extensive human experience. This knowledge encompasses understanding the names of plants, their therapeutic effects, the parts of the plant where active substances are found, the season of maturity and their toxicity.

In our survey, we identified the main health conditions for which medicinal plants were used, including:

- Digestive disorders,
- Metabolic conditions, especially diabetes,
- Dermatological conditions,
- Respiratory conditions,
- Inflammatory problems,
- Gynecological issues.

The beneficial aspect of medicinal plants has been highly valued by humans since ancient times. However, parallel to this appreciation, there has also been a great understanding of the risks and toxicity associated with these plants since antiquity. Among those who possess knowledge of the therapeutic uses of plants and their effectiveness in treating human and even animal diseases, there is also awareness of the toxicity and contraindications associated with these plants.

All this information has been studied and scientifically founded through research work, which has been practically validated with our survey. Indeed, the toxic aspect of medicinal plants manifests itself in various ways depending on the plant, the season, and the individual consuming them. The following signs characterize the main toxic effects:

- Neurological signs: delirium, convulsions.
- Cardiovascular signs: arrhythmia, hemorrhage.
- Gastrointestinal signs: abdominal pain, diarrhea, poor digestion.
- Dermatological signs: hives, itching.
- Nephrological signs: urinary retention, hematuria.
- Gynecological signs: hemorrhage, pregnancy termination.

The Tables 1-6 classified according to toxicity signs the name, the Latin name and the families of plants used during our field survey.

Neurological Toxicity Attributed during Our Survey 2

The Solanaceae family is the most involved in these neurological disorders such as Black Nightshade, Henbane, *Datura*,

Mandrake and Blue Tobacco, causing atropine-like symptoms (dry mouth, dilated pupils, hyperthermia, facial flushing, tachycardia, restlessness, hallucinations and delirium). These plants contain alkaloids, including hyoscyamine (the main alkaloid), scopolamine, and atropine. These alkaloids act as competitive antagonists of peripheral and central acetylcholine. Treatment is mainly symptomatic. Physostigmine (or eserine), a reversible inhibitor of acetylcholinesterase, increases the concentration of acetylcholine in the synaptic cleft and allows stimulation of muscarinic and nicotinic receptors. The Compositae family (White Mugwort, Field Mugwort, etc.), with the major component thujone, is responsible for neurotoxic effects such as hallucinations and convulsions at high doses. Concerning neurological toxicity attributed to the identified plants in our survey were: *Zizyphus lotus* (Rhamnaceae), *Peganum harmala* (Zygophyllaceae), *Atractylis gummifera* (Asteraceae), *Nerium oleander* (Apocynaceae), *Artemisia alba* (Asteraceae), *Juniperus communis* (Cupressaceae), *Nicotiana glauca* (Solanaceae), *Artemisia absinthium* (Asteraceae), *Solanum nigrum* (Solanaceae), *Hyoscyamus niger* (Solanaceae), *Datura stramonium* (Solanaceae), *Mandragora officinarum* (Solanaceae), *Colchicum autumnale* (Liliaceae), *Papaver rhoeas* (Papaveraceae), *Rosmarinus officinalis* (Asteraceae), *Arum arisarum* (Lamiaceae), *Urginea maritima* (Araceae), *Globularia alypum* (Liliaceae) and *Artemisia campestris* (Globulariaceae).

Toxicity of the Cardiovascular System Attributed during our Survey

Cardiovascular toxicity was characterized by symptoms such as arrhythmia, tachycardia and a drop in blood pressure with tachycardia, and collapse, which can result from significant gastrointestinal losses, for example, after ingesting castor bean seeds. Some plants may exhibit a marked cardiac tropism, often manifesting after preceding digestive symptoms. *Nerium oleander* can cause the same type of poisoning. Other plants share cardiac toxicity, usually associated with neurological toxicity. Some plants, such as *Atractylis gummifera* and *Ferula communis*, have effects on the blood, including hemolytic and hemorrhagic actions.

The plants with cardiovascular toxicity identified during our survey were:

Atractylis gummifera, Nerium oleander, Solanum nigrum, Hyoscyamus niger, Globularia alypum, Marrubium vulgare, Ricinus communis, Ferula communis, Mandragora officinarum, Artemisia alba, Colchicum autumnale, Arum arisarum, Chenopodium murale, Urginea maritima and *Anagallis foemina.*

Gastric Toxicity Attributed to the Surveyed Plants includes Symptoms such as Nausea, Vomiting and Abdominal Pain

Intoxication occurs after a latency period of a few hours to a few days. The main effects are severe digestive disorders such as nausea, vomiting, diarrhea, and abdominal pain, often accompanied by dehydration and collapse. It is important to seek medical attention in cases of plant poisoning to receive appropriate treatment and support.

The plants with Gastric toxicity that is identified during our survey were: *Citrillus colocyntis, Zizyphus lotus, Atractylis gummifera, Artemisia alba, Colchicum autumnale, Rosmarinus officinalis, Urginea maritima, Chenopodium murale, Eruca sativa, Ruta Graveolens, Asparagus officinalis, Ajuga iva, Aloe vera, Ecballium elaterium, Senecio vulgaris, Eryngium campestre* and *Anagallis Foemina.*

Toxicity Dermatological Attributed to the Surveyed Plants

The list of the plants identified in the survey associated with dermatological toxicity showed in the Table 1. Intoxication by these plants manifests as dermatological signs:

Allergic Contact Dermatitis

Defined as an allergic reaction. It can clinically present in two different forms:

Acute form characterized by pruritic lesions, such as macules, papules, vesicles, or blisters.

Chronic form characterized by lichenification, sometimes associated with secondary skin infection.

Mechanical Irritant Dermatitis

Skin involvement is often caused by various plant protrusions: thorns (roses, cacti), irritating hairs (nettles), and glochids (cacti, Opuntia spp). The extent of the lesions is often inversely proportional to the size of the thorns or glochids causing them. It should be noted that these protrusions can not only trigger irritant dermatitis but also inoculate pathogenic microorganisms.

Chemical irritant dermatitis

Various substances can cause chemical irritant dermatitis: formic acid (nettles), acetic acid, oxalic acid, malic acid, citric acid, certain glycosides (buttercups), phenols (euphorbias), crystalline compounds (calcium oxalate crystals). These substances were found in the plant's sap or specific organelles.[8,9]

*Laurier-rose (*Nerium oleander*) (Figure 1).

*Armoise blanche (*Artemisia alba*).

*Chardon à glu (*Atractylis gummifera*).

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Table 1: Statistics of diseases treated by the identified medicinal plants.

Diseases	Percentage of usage (%)
Dermatology	41.3
Gastrology	32.6
Diabetic	23.9
Neuro-psychiatric	21.7
Rheumatism	17.4
ENT	17.4
Cardiovascular	15.2
Gynecology	10.9
Other	10.9

*Jusquiame (*Hyoscyamus niger*).

The plants with dermatological toxicity collected during our survey were: *Citrillus Colocyntis, Zizyphus lotus, Atractylis gummifera, Artemisia alba, Colchicum autumnale, Rosmarinus officinalis, Urginea maritima, Chenopodium murale, Eruca sativa, Ruta Graveolens, Asparagus officinalis, Ajuga iva, Aloe vera, Ecballium elaterium, Senecio vulgaris, Eryngium campestre* and *Anagallis foemina*.

Nephrological Toxicity Attributed to the Surveyed Plants

Some plants are used as diuretics and can cause damage to the kidneys (such as juniper berries), while others can have inflammatory effects on the urinary tract (such as colchicum and oxalis). Oxalis is rich in soluble oxalates and oxalic acid. The most toxic oxalates are sodium oxalate and potassium acid oxalate. These substances combine with calcium ions to form insoluble calcium oxalate. By combining with calcium ions, they can cause hypocalcemia. The precipitation of calcium oxalate crystals in the urinary tubes can lead to traumatic kidney damage, resulting in nephritis. Transplanted patients are particularly at risk because an interaction between a plant and an immunosuppressant can put them at risk of rejection.

Concerning the plants with nephrotoxicity we found:

- *Retama monosperma,*
- *Ecballium elaterium,*
- *Oxalis pes-caprae,*
- *Artimisia campèstris,*
- *Asparagus Officinalis*,
- *Juniperus Phoenicia,*
- *Colchicum Aumumnale.*

Gynaecological Toxicity Attributed to the Listed Plants during our Survey

The active compounds in these plants (Harmal, Rue, Chicory) can cause pregnancy termination in women[8,9] Some plants (Ruta graveolens) can cause reproductive function disorders such as persistent heat, miscarriage, etc., similar to those resulting from estrogenic hypertension. *Aloe vera* (Figure 2) presents risks of fetal malformation (teratogenic risk). Other plants are contraindicated in pregnant women, such as wild chamomile, juniper, etc.,

Diseases Treated by the Medicinal Plants Identified in the Survey

According to the statistics from our field survey in the targeted regions of southern Tunisia, we observe that dermatological diseases are the most commonly treated conditions traditionally using medicinal plants. These diseases include scars resulting from snakebites or scorpion stings, as well as the treatment of ringworm and mange in camels. The Table 1 below presents the statistics of diseases treated by the identified medicinal plants and their corresponding percentages.

Gastric disorders rank second in terms of the use of these medicinal plants. These plants were mainly used to treat liver conditions (jaundice, yellowing of the skin, loss of appetite, constipation, abdominal pain, etc.). Diabetes is the most prevalent metabolic disease among the populations of the explored regions, which explains the prominent use of these anti-diabetic plants. Many neurological disorders such as epilepsy, insomnia, and convulsions were treated with a number of these plants. Other diseases were also treated with the identified plants from the survey, including rheumatic, ENT (Ear, Nose, Throat), cardiovascular, and gynaecological conditions (especially for treating infertility, inducing abortion, or as aphrodisiacs), as well as various other diseases (parasitic, etc.,).

Statistics of Toxicity Attributed to the Plants

The purpose of our survey was to examine the toxicity of the plants such as the neuropsychiatric disorders that's played a predominant role and mainly manifested by convulsions, epilepsy, delirium, hallucinations, mydriasis, nervous system excitation, and dizziness. The plants responsible for these symptoms mainly belong to the Solanaceae family, such as *Datura*, Hyoscyamus, Harmala, Nicotiana glauca, Mandragora, etc.,

Cardiovascular disorders primarily occur due to the use of plants containing cardio-tonic heterosides, including *oleander, Globularia*, Sticky Catchfly, *Ajuga iva*. These disorders manifest as rhythm disturbances, hemorrhages, etc.,

Gastric disorders mainly result in hepatotoxicity, diarrhea, vomiting, and anorexia. Dermatological disorders are primarily characterized by severe dermatitis (Euphorbia, Nettle, Rue, etc.,).

Table 2: Statistics of diseases treated to identify the toxicity of plants.

Diseases	Percentage of toxicity (%)
Neuro-psychiatric	41.3
Cardio-vascular	32.6
Gastrology	26.1
Dermatology	17.4
Neuphro-toxicity	15.2
Gynecology	8.7

Table 3: Classification of the plants in French name with different degree.

Degree 1	Degree 2	Degree 3
chardon à glu	Absinthe	Aloe
Datura	Arum (gouet à capuchon)	Armoise blanche
Harmal	Clochique	Armoise champètre
Jusquiame	coloquinte	Asperge
Mandragore	Concombre d'ane	Chardon marie
Morelle noir	Ferule	Chardon roland
Ricin	Germendrée	Chenopode des mures
Scille de mer	laurier rose	Chicorée sauvage
	Nicotiane glauque	Coquelicot
	Retam	Euphorbe
	Rue	Genevrier de phénicie
	Saligne à balai (Haloxylon)	Globulaire
		Ivette musquée
		jujubier
		Marrube
		Mourron Bleu
		Ortie
		Oxalis des bermudes
		passerine annuelle
		Periploque
		Rosmarinus
		Roquette
		Séneçon vulgaire
Classification of the degree of the toxicity attributed during our survey (Percentage of the plants).		
Degree 1 (17.4%)		
Degree 2 (26.1%)		
Degree 3 (56.5%)		

Nephrotoxic disorders (hematuria, albuminuria, urinary retention) as well as gynecological disorders (abortion, premature delivery) also occupy a significant place in the toxicity attributed to the surveyed plants, with a considerable percentage.

The Table 2 illustrated the toxicity associated with these plants.

Classification by Degree of Toxicity Assigned to the Identified Plants during our Survey

During our survey, the identified plants were classified into three main categories based on three degrees of toxicity:

Degree 1: Highly toxic: This degree includes plants that cause immediate and imminent death, even at low doses and in the short term.

Degree 2: Toxic: This degree includes plants that cause death at high doses and/or prolonged exposure.

Degree 3: This degree includes plants that cause intoxication symptoms without being lethal, even at high doses and/or prolonged exposure.

The following Table 3 illustrate the classification of all the identified plants during our survey according to the aforementioned definitions of degrees of toxicity.

Study of some Toxic Plants of the Flora of Southern Tunisia

In the present work, it has sometimes been difficult to make consistent taxonomic choices. However, this work is only one-step towards updating knowledge of the flora of southern Tunisia. Many taxa (species, subspecies and varieties) once ignored are now considered part of the flora of southern Tunisia. The determination of these plants leads us to propose as the next step the writing of determination keys for these plants. In the long term, it is even necessary to consider the overhaul of all this information and the drafting of a new Flora of southern Tunisia.

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The presentation of the taxa (species, subspecies, varieties and forms) discerned, of the Tunisian flora, was done following hierarchical order of divisions:

I Pteridophyta

II Spermaphyta

1. Gymnospermae

2. Angiospermae

Dicotyledoneae

Monocotyledoneae

In these divisions, the taxa was classified into families, genera, then species, subspecies and possibly varieties and forms, all arranged in alphabetical order and with the following writing conventions:

The work pertaining to biodiversity and especially plant biodiversity has become a source of knowledge concerning biological wealth at the level of territories (ecosystems, landscapes, biomes, regions, countries, continents).

Family

Family names were placed in the middle of the page. These surnames take into account the current nomenclature proposals. So, dealing only with the most important families, Umbelliferae were treated here under the family name Apiaceae, Compositae under the name Asteraceae and Grasses under the name Poaceae. Older names (still valid) were placed in correlation, in square brackets and in smaller capital letters, after the adopted name.

Some old families may have been split into several new families. Thus, the Liliaceae are here subdivided into Aloaceae,

Anthericaceae, Asparagaceae, Asphodelaceae, Colchicaceae, Liliaceae, etc.

Genus-Species

The scientific name (genus, species), considered currently applicable (The scientific name is completed by the name (or the abbreviation of the name) of the author (or authors) as well as the codified reference (journal, pagination, year) of its citation in a scientific publication.

Sub-Species, Variety, Sub-Variety and Form

The identification of a taxon sometimes requires that the subdivision (s) be mentioned at the infraspecific rank: subspecies (subsp.), Variety (var.) or even more exceptionally subvariety (subvar.) and form (forma or f.). The current trend implies retaining exclusively truly characterized subdivisions and to eschew taxa splits that are only caused by morphological variations. Despite everything, this position remains partly subjective. However, it has resulted in this document not taking into account a large number of subdivisions of infra-specific rank (mainly varieties, sub-varieties and forms). While it did not seem imperative to quote them, these subdivisions were plainly stated in the additive note to the taxon to which they refer.

Bitter Cucumber or Coloquinte (Figure 3)

Vernacular names are colocynth, bitter gourd, bitter apple, and colocynth or bitter cucumber (English), Coloquinte (French).[10] The bitter cucumber, a plant belonging to the cucurbitaceous family such as pumpkin, gourds...

Dried fruits are used with their seeds.

Extremely severe pain patient "folded in half" "Homeopathic Hedgehog".

After angry, Indignation, Vexation.

Typology

• *Psyche/Behaviour*

* Irritable, "nervous" individual, quick to anger, indignation, annoyance.

These can trigger paroxysmal pain (gets angry for a trifle, susceptible). Sensitive to injustice in relation to his "rights" for which he fights, forgetting that he has "duties".

* "Sick of his anger" like Staphysagria but Staph. don't show her anger.

* Neuralgia after anger.

• Sensitive (or physical) type

Subjects nervously worn out by prolonged worries; very agitated and contorting during painful attacks; big eaters.

Pathogenesia/General Action

Toxicology and experimentation provoke

* Very violent pains-spasmodic-paroxysmal; colic in the digestive, female genital or incidentally urinary sphere.

* Paroxysmal neuralgia especially at the level-trigeminal-crural–sciatica.

Characteristic Symptoms

Very great remedy for pain and colic.

* Very violent pain, paroxysmal, crampoid and discontinuous but close together, with little respite.

* Terrible stomach aches forcing to double in half, improved by heat and pressure; diarrhea with stool emission with each attempt at solid or liquid food.

Sometimes:

Feeling of bond, of "wire", of constriction, of numbness.

Feeling as if you are squeezing "between two stones" (intestinal pain).

Figure 1: Laurier rose.

Modalities

• Aggravation <by anger, <by rest, <by cold.

<by extension of the affected region.

• Improvement.

> By strong, hard pressure on the painful spot (similar to Bryonia).

> Usually by heat (unlike Bryonia).

> By movement (unlike Bryonia), screams when in pain.

> By bending in 2 or by bending.

(If complains of the belly, folds in half; if sciatica, it folds the sore leg).

• Causalities (continuation of) Anger ++. Grief. Cold.

Outrage at an injustice.

• Sensations Violent, paroxysmal, crampoid pain; constriction by a "wire"; boring; in a flash.

Main Clinical Indications

* Digestive-hepatic colic-painful diarrhea (often a result of anger).

- Abdominal colic, not improved by gas.

- Whatever the etiology, if improved curved in 2.

* Urinary-renal colic, especially Left.

* Genitals-dysmenorrhea (painful menstruation) improved when folded in half.

* Neuralgia.

• Facial-mostly Left but not exclusively; supraorbital neuralgia Left.

- Pain in successive waves improved> by pressure,> heat.

• Sciatica-especially left, crampoid, searing (like an electric jerk) with a feeling of tightness.

Agg <extension, <cold, <rest.

Amél> heat,> strong pressure on the bent leg.

+/- numbness of the painful area (like Rhus Tox).

So-quickly effective-continuation of indignant anger for trifles.

-spasmodic, violent pain (abdominal, joint) improved>by bending.

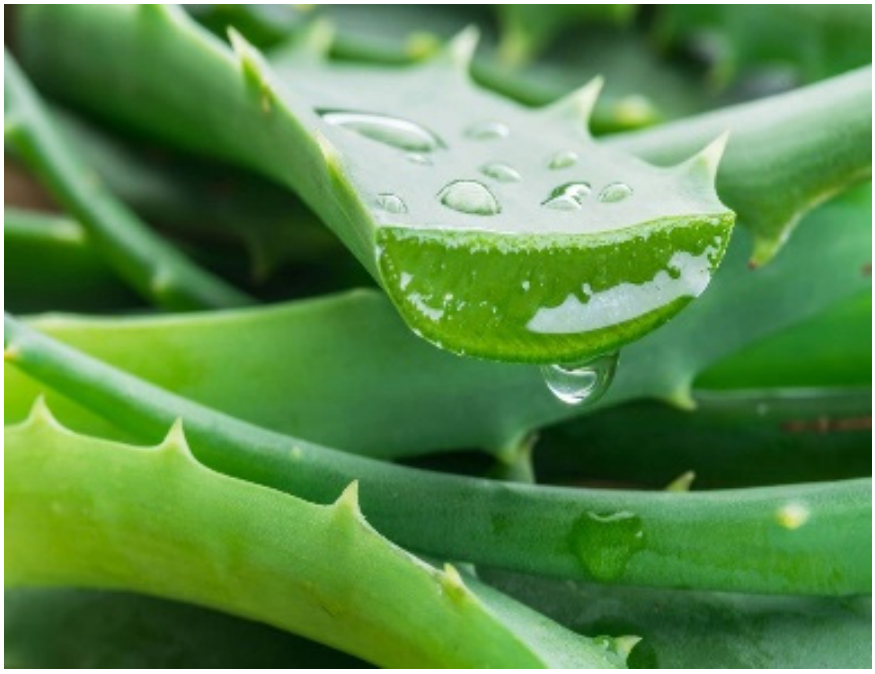

Figure 2: *Aloe vera* L.

Comparisons

In anger, Colocynthis forms with Chamomilla and Staphysagria the TRIO anger. Staphysagria is the remedy for the "stuck anger"/ Chamomilla throws and breaks, when uncontrollable pain.

In Bryonia pain: Pain improved by strong pressure. Magnesia Phosphorica: same pains, but it is sad during the pain (without anger).

Dioscorea: Relieved by stretching -Plumbum: retraction of the abdomen -Cuprum: crampoid pain.

Dosage usual prescription rules was based to choose a dilution as much higher as there are general and psychological signs and the remedy is only repeated when the effect wears off G (return of pain for example).

Datura (*Datura stramonium* L.) (Figure 4)

The Datura genus includes roughly twenty species, the most abundant of which is *Datura stramonium* L., also termed jimsonweed, devil's weed, thorny apple, mole weed (jimson weed). It is an herbaceous plant, belonging to the Solanaceae family, abundant in Europe where it likes wasteland and roadsides; it is widely cultivated for its decorative aspect. It blooms from July to October (large white trumpet-shaped flowers). Its fruit is a large spiny ovoid capsule that contains many seeds. All parts of the plant contain alkaloids including hyoscyamine (the main alkaloid), scopolamine and atropine; these alkaloids are peripheral and central competitive acetylcholine antagonists. *Datura* induces, like belladonna, a para sympatholytic effect but the intensity of which is stronger.

The most prevalent mode of poisoning involves the consumption of this plant for addictive purposes in the form of a decoction, ingestion of seeds or the use of cigarettes made from the dried leaves.[11,12] Intoxication results in an anticholinergic syndrome with mainly neuropsychic symptomatology with psychomotor excitement, inconsistent speech, hallucinations, visual, disorientation and aggressiveness. Among the peripheral anticholinergic signs, the presence of bilateral mydriasis is noticed, while the other anticholinergic signs are more inconsistent: dry mouth, sinus tachycardia, hyperthermia, urinary retention and vomiting.

In severe cases, coma and convulsions were observed. The course is generally favourable within 24 to 48 hr. The diagnosis can be confirmed by blood and urine determination of alkaloids by liquid chromatography coupled with double mass spectrometry.[13,14] The treatment is symptomatic. Physostigmine, available in France under the name Anticholium and subject to a nominative ATU, can be used in cases of severe poisoning.

Oleander (*Nerium oleander* L.)

It is a 2 to 3 m tall shrub (*oleander*) belonging to the Apocynaceae family. Generally, the leaves are evergreen and the flowers, pink, red, or white, are present from June to September.[15] All parts of the plant contain heterosides, the main one being oleandrine, which is similar in structure to digitalis. Poisoning most often occurs in adults in a suicidal context.[16,17] The symptoms of intoxication are those of digitalis intoxication with digestive disorders (nausea, vomiting), neurosensory disorders (agitation, confusion, color vision disorders), cardiac disorders linked to the inhibition of the Na^+ pump/Membrane K^+ ATPase (bradycardia, conduction and/ or automatism disorders).

Figure 3: Coloquinte.

These disorders can be associated with hyperkalaemia, a serious factor in this intoxication.[18,19] The dosage of asoleandrine is not carried out in current practice, it is the digoxin assay that is generally used to evaluate. The severity of the poisoning even if there is no strict correlation between the measured concentration and the severeness of the poisoning.[20] The effectiveness of activated charcoal is likely, although there is no consensus on its mode of administration (single dose versus multiple doses).[21] The treatment includes, in addition to the administration of atropine in the event of bradycardia and the careful correction of ionic abnormalities, the administration of anti-digitic antibodies whose indication is based on clinical, electrocardiographic, and laboratory criteria (kalaemia).

Botanical Characters

Aloe is a stemless perennial indigenous to equatorial Africa belonging to the liliaceae family.

It is a fleshy plant, adapted to periods of drought and a hot climate; its thorny leaves can reach 60 cm. The leaves in a bouquet are fleshy, lanceolate, thick, rigid, and with (or having) a prickly edge. The flowers are yellow lumped up in a cluster carried by a large flower stalk and the fruit is a capsule.

Major Active Principles

The aloe leaf essentially contains:

Anthraquinones: Aloin, which is a product, marketed from the resin.

Aloe contains barbaloin (Aloin A) as its main constituent.

Aloesin (Aloeesin B), Barbaloin, and Isobarbaloin (Aloin B) are found in many genera of Aloe. Aloe-emodin is formed by the action of oxygen in the air on barbaloin (oxidation). Aloein (A) has been isolated from commercial aloin. 8- CGlucosyl-7-O-methyl-(S) -aleosol, isoaloesin D and aloeesin E have recently been isolated from Aloe barbadensis (*Aloe vera*). Their concentration is greater from the base to the top of the leaf and decreases with the age of the leaf. These phenolic compounds are up to 3 times more important in the sub-epidermal layer of the leaf than the gel. The marketed aloin, used as unpurified "crude" barbaloin, has a very different composition according to the producers. The other anthraquinones are aloetic acid, anthranol, esters and cinnamic acid (derived from cinnamon).

Two products are obtained from the leaves of *Aloe vera*, both of which have had medical implications for several centuries. The fraction called "gel" obtained from the pulp which is colorless and odorless used particularly in the treatment of skin problems. It contains a lot of water and sugars (polysaccharides). Yellow exudates from the more superficial layers of the leaf (inner epidermal layers) is a yellow and extremely bitter liquid containing the <<aloin >>. Aloin which is the "raw" product marketed from aloin resin contains as its main constituent a substance called

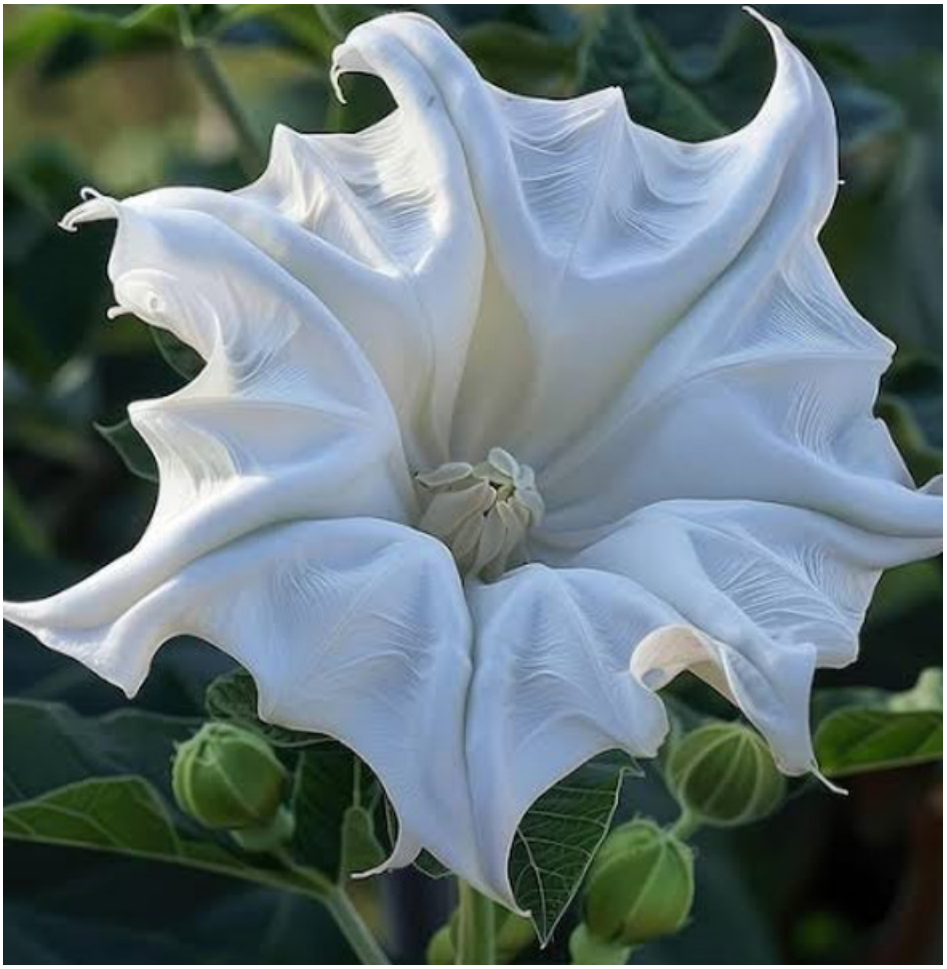

Figure 4: *L. Datura.*

"barbaloin". It increases digestive motor skills and is used to treat constipation.

-Mono and polysaccharides: cellulose, glucose, mannose, etc.,

-Amino acids: practically all present, including 7 of the 8 amino acids essential for life that our body cannot synthesize and that it needs daily in the diet.

-Mineral elements: calcium, magnesium, chlorine, copper, chromium, iron, lithium, manganese, phosphorus, potassium, sodium, zinc.

-Vitamins: A, B_1, B_2, B_3, Vit PP, B_6, B_9, B_{12} to C to E. Enzymes: amylases, catalases, cellulases, lipases, oxidases and phosphatases.

Properties

Digestive: stomachic, cholagogue and laxative. Vulnerable: are suitable for promoting the healing of wounds and contusions, linked to its bactericidal, hemostatic, anesthetic, healing and anti-inflammatory actions.

Traditional and Current Use

Aloe has been used for a long time in traditional medicine, this plant is endowed with remarkable qualities; Clear aloe gel is mucilaginous, it is obtained by cutting the leaves which are used to be applied directly to the skin for the treatment of wounds, burns, sunburns, eczemas and wounds, therefore, it accelerates the scarring and reduces the risk of infection. The gel can be mixed with honey to treat erysipelas (painful inflammation of the epidermis).

Aloe preparations are very bitter, hence the vernacular name: a patience was associated with the gallbladder (marara) indicating bitterness in the sense of overcoming a sour or bitter experience.[22] To express such an unpleasant experience, Sunni Muslims say, “patience is bitter” (aṣṣabr murr).[23] In internal use, the latex has laxative properties (stimulating the large intestine), in case of constipation and poor digestion to rebuild the intestinal flora and regenerate the digestive system. Other sources indicate its use to lower blood glucose levels in diabetics and in cases of venous circulation. It activates the hepatic and biliary renal functions and alleviates arthritis and rheumatic pain.

Toxicity

Aloin represents the toxic substance in aloe, it is extremely bitter and has a very strong irritation potential that can cause cramps, bloody diarrhea, and nausea. A substance called "aloesin" decreases the activity of cells responsible for pigmentation (melanocytes) *in vitro*. It acts synergistically with arbutin.[23]

Contraindications

Some reports suggest that aloe should not be consumed during pregnancy and while breastfeeding. Following overdoses, the purgative effects become more serious which causes malformations in the foetus and even abortion. It is also indicated that it is strictly forbidden to use aloe for the treatment of hemorrhoids, appendicitis, ulcers, varicose veins, diarrhea, hypoglycemia, heavy menstruation and acute intestinal inflammation. Prolonged use is prohibited for more 8 to 10 days.

Drugs Interactions

At high dose and during prolonged use the risks were:

Possible loss of potassium leading to increased toxicity of antiarrhythmics.

Atlas of the risks of traditional herbal medicine to study 57 plants recommended by herbalist.[22]

Possible increase in potassium losses caused by certain diuretics 22 (Hydrochlorothiazide, Furosemide and corticosteroids (Prednisone, cortisone).

Possible increase in the effect of Lanoxin. and reduction in the absorption of oral drugs due to an acceleration of intestinal transit. Aloe gel risks amplifying the action of oral hypoglycemic agents (Diabeta, Diamicron).

CONCLUSION

Certain number of plants contain cardiotoxic and neurotoxic alkaloids. Their consumption can cause severe poisoning, the diagnosis of which may be unrecognized in the absence of precise historical data.

Therefore, for any patient admitted in a context of digestive disorders and presenting cardiovascular disorders and/or neurological signs (paraesthesia's, confusion, convulsions, etc.), the hypothesis of plant intoxication should be mentioned. A blood sample taken on admission will allow, if necessary, a determination of specific alkaloids in order to confirm the diagnosis and to progress in the study of a clinic biological correlation for infrequent, serious cases of intoxication generated by agents present in our immediate environment.

This work is a contribution to the study of the toxicity of traditionally used medicinal plants in the flora of southern Tunisia. The field survey was conducted using a predefined form and questionnaire targeting the most well-known medicinal plants of the flora in southern Tunisia was presented in the manuscript. Previous studies on these medicinal plants were mainly focused on ethnobotanical aspects. The approach involved visiting a maximum number of herbalists or individuals living in the targeted regions of southern Tunisia who have extensive knowledge of the local flora, including their efficacy and toxicity. The primary aim was to objectively answer the questionnaire. This part also includes the analysis of the survey results, including summary tables, and the details of plant monographs will be appended to the work. A discussion of these results is also presented. The work concludes with a conclusion and potential future directions.

The present work represents just one-step in updating the knowledge of the flora in southern Tunisia. The identification of these plants leads to the proposal of the next step, which is the development of identification keys for these plants. It is even advisable to consider revising all this information and writing a new Flora of Southern Tunisia.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

CRDA: Regional Agricultural Development Commissions; **ENT:** Ear, Nose, Throat; **s:** Subdivision; **subsp:** Subspecies; **var:** Variety; **subvar:** Subvariety; **f:** Forma; **ATP:** Adenosine Triphosphate.

SUMMARY

The study investigates the toxicity of certain plants containing cardiotoxic and neurotoxic alkaloids. Consumption of these plants can lead to severe poisoning, and diagnosing such cases can be challenging without detailed historical data. The study emphasizes the importance of considering plant intoxication in patients admitted with digestive disorders and presenting cardiovascular and/or neurological symptoms. To achieve this, a field survey was conducted in southern Tunisia, targeting well-known medicinal plants. The research methodology involved visits to herbalists and individuals with extensive knowledge of the local flora. The objective was to collect information on the

efficacy and toxicity of these plants through a predefined form and questionnaire. The results of the survey, presented in summary tables and detailed plant monographs, form the basis for the analysis and discussion in the research. Blood samples taken on admission allow for the determination of specific alkaloids, confirming the diagnosis and facilitating clinical-biological correlations in serious cases of intoxication. This work represents a significant step in updating the knowledge of the flora in southern Tunisia. The identification of these plants suggests the development of identification keys as the next research phase. Furthermore, the study recommends revising this information and compiling a new Flora of Southern Tunisia. Overall, this research contributes to understanding and addressing the potential risks associated with traditionally used medicinal plants in the region.**Figure 1:** The geographical location studied of southern Tunisia.**Figure 2:** The Beni Khadeche region in Medenine.**Figure 3:** Tataouine region.**Figure 4:** Gabes region-direction Kebelli.**Figure 5:** Gabes region in Toujene.**Figure 6:** Coloquinte.

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