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ملخص

تم إجراء دراستنا في مختبر الابحاث بالمركز الجامعي عبد الحفيظ بوصوف ميلة يهدف هذا العمل الى القيام بدراسة مورفولوجية لكل من نبات القراص و الالوفيرا في كل من الجزئيين الخضري و الجذري ، اما الدراسة الثانية هي دراسة الكيميائية النباتية لكل من النباتات المدروسة و ذلك لمعرفة اهم المواد او المركبات التي تلعب دور فعال في عملية العلاج.

انتشر في الاونة الاخيرة العلاج بالنباتات الطبية في العديد من دول العالم اهمها الجزائر، و تطرقنا في موضوعنا هذا الى نوعين اساسيين من هذه النباتات هما نبات القراص و نبات الصبار. نبات القراص هو نبات عشبي و قد استخدم في مختلف المجالات منذ عصور ما قبل التاريخ و له اهمية كبيرة في العالج الطبي ، اما نبات الالوفيرا هي نبات دائم معروف ايضا منذ القديم ولها العديد من الفضائل الطبية و تعتبر من النباتات الشائعة في مجال التجميل.

من خلال نبات القراص و الصبار، يساهمان بشكل كبير في تنوع النباتات، على سبيل المثال، في تجربتنا، لاحظنا اختلافات طفيفة في طول الجذور وعدد الأوراق. ومن الجدير بالذكر أن الصبار والقراص يظهران اختلافات واضحة، لا سيما في طول الساق والوزن الطازج والوزن الجاف والتي قد تعزى إلى الاختلافات في محتوى الماء أو الشكل الخارجي. من خلال الفحص الكيميائي النباتي، غطى التحليل الأجزاء الخضرية والجذرية. أظهر نبات القراص وجود نسب عالية من مركبات الفلافونويد والعفص والمركبات الفينولية والجليكوسيدات والصابونين في الغالب في أجزائه الخضرية، بينما كانت الأجزاء الجذرية تفتقر إلى التربينويدات والكينونات والأنثراكينونات. أظهر الصبار ثراءً في العديد من المواد الفعالة مثل الصابونين والجليكوسيدات والكومارين والكينونات، خاصة في أجزائه الهوائية، مع غياب العفص والمركبات الفينولية في الجزء النباتي والفلافونويدات والكومارين في الجزء الجذري.

الكلمات المفتاحية

نبات القراص؛ نبات الالوفيرا ؛ المستقلبات الثانوية ؛ الفلافونويدات ؛ الوزن الجاف

Abstract

Our study is carried out in the research laboratory at the Abdelhafid Boussouf University Center of Mila. This work aims to conduct a morphological study of both *Urtica dioica* and *Aloe vera* plants focusing on both their vegetative and root parts.. The second objectif is a phytochemical study out of each plant to identify the most important substances or compounds that play an effective role in the treatment process.

Recently, the use of medicinal plants for treatment has become widespread in many countries around the world, with Algeria being one of the most notable examples. The *Urtica dioica* is a herbaceous plant and has been used in various fields since prehistoric times and has great importance in medical treatment. As for the *Aloe vera*, it is a perennial plant that has also been known since ancient times and has many medicinal virtues and is considered one of the common plants in the field of cosmetics. Through the Urtica dioica and Aloe vera they contribute significantly to plant diversity, For instance, in our experiment, we observed slight variations in root length and leaf count. Notably, Aloe vera and Urtica dioica exhibit distinct differences, particularly in stem length and fresh weight and dry weight which may be attributed to differences in water content or external morphology, In this study of Urtica dioica and Aloe vera through phytochemical screening, the analysis covered both vegetative and root parts. Urtica dioica (nettle) showed high levels of flavonoids, tannins, phenolic compounds, glycosides, and saponins predominantly in its vegetative parts, while its root parts lacked terpenoids, quinones, and anthraquinones. Aloe vera exhibited richness in various active substances like saponins, glycosides, coumarins, and quinones, primarily in its aerial parts, with an absence of tannins and phenolic compounds in the vegetative part and flavonoids and coumarins in the root part.

keywords

Urtica dioica; *Aloe Vera*; Secondary metabolites; Flavonoids; Dry weight.

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List of abbreviations

- **Ml**: Millilitre
- **Mm**:Millimetre
- **Cm**: Centimetre
- HCL: Hydrochloric acid
- **%:** Percentage
- **UV:**Ultrviolet
- **NaCl :** Sodium chloride
- **C° :** Degree Celsius
- **PH** : Hydrogen Potential
- **g :** gramme
- **NaOH :** Sodium hydroxide
- **NH4OH :** Ammonium hydroxide
- **H2SO4 :** Sulfiric acid
- **CHCl3 :** Chloroform
- **FeCl3 :** Ferric chloride
- **RL :** Root length
- **SL :** Stem length
- **FW :** Fresh weight
- **DW :** Dry weight
- **CL :** Composite leaves
- **T° :** Temperature
- **BC :** Befor christ
- **Min :** Minute

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INTRODUCTION

Medicinal plants are found all over the world, and they are essential to preserving the ecological balance on the planet, where humans eat and depend significantly on plants. Plants offer a number of advantages, including beautiful, aesthetically pleasing views that are indispensible **(2008، خضر)**.

Almighty God has given certain herbs the ability to heal a wide range of illnesses, and some accomplished people dedicate their lives to researching certain herbs to learn about their properties, drawbacks, advantages, how to combine them, and the necessary dosages. Many of these herbs are now used by contemporary medicine in the form of pills, capsules, syrups, or ointments after they have been thoroughly cleaned and sterilized. To demonstrate to the patient how to utilize them, they are frequently stored in sterile containers attached to them **(2008، خضر).**

Medicinal plants are the mainstay in the medical field and are also considered an important source for treating various diseases and alleviating the symptoms of many health problems. This is called alternative medicine or herbal medicine **(El Rhaffari et Zaid, 2002)**.

Because they can be employed as models for pharmacologically active chemicals or as raw materials for the production of medications, medicinal plants are becoming increasingly significant for pharmacological research and the creation of pharmaceuticals **(OMS, 1998).**

Urtica dioica L. Is an herbal plant of the Urticacea family. It has been utilized as a natural remedy for more than 2,000 years. However, it wasn't until the early 20th century that its medical relevance began to develop **(Ait Haj Said *et al*., 2016).** Because of its stinging power, nettle is a quickly recognizable plant. In fact, the plant known as "*Urtica dioica*" is thought to be rich in vitamins, minerals, and antioxidants such as phenolic compounds. It is an incredibly nutrient-rich plant, which makes it useful for nutrition and is used in many industries such as horticulture, agriculture, animal feed, and cooking **(Draghi, 2005)**.

Among the most commonly used medicinal plants, *Aloe vera* is one of the oldest medicinal plants. However, over the centuries and especially in recent years, there has been a clear interest in this type of plant that can be used locally, for example, in the case of skin diseases, and by mouth to strengthen the immune system in the case of fungal, bacterial, or even viral infections **(Helle, 2006)**.

The objectif of this study is to know the morphological properties of two types of medicinal plants (Urtica dioica and Aloe vera) and to compare their contents of phytochemicals in both the vegetative (upper) and the root (lower) parts.

Our study includes Four chapters:

- The first chapter: generalities about medicinal plants.
- The second chapter: includes two important types of medicinal plants, which are the nettle plant known as ***Urtica dioica*** and the ***Aloe vera*** plant.
- The activity The third chapter of the pilot study presents the methods and procedures used for plant chemical tests, phytochemical survey, and antioxidant activity.
- Fourth chapter is about results and discution .
- Finally, we concluded our study with a general conclusion summarizing all the obtained results.

CHAPTER 1

Generalities about medicinal plants

I.1. Historical overview of medicinal plants

Historically, medicinal plants have played a significant role in medicine by being applied to diseased areas of the body by restoring wild plants or portions of them to their natural state. Since ancient times, people have looked for herbs that can ease this kind of pain or that. According to historical sources, the Rafidain Valley has a very long history with neurology that dates back to the Sumerian era **4,000 BC**. The Sumerian civilization left behind this flag, which the Babylonians and Assyrians eventually adopted (**1977، أحمد اليونس وعبد الله كركجي**).

I.1.1. In egypt

Herbal medicine was also practiced by the ancient Egyptians during the same historical period as the Rafidain Valley civilization, it discovered antiques in the Pharaohs' tombs and raised the lines of many plants used in treatment, indicating their interest in medicinal herbs. She also discovered that the ancient Chinese and Indians were interested in this field, as evidenced by their numerous observations about these herbs in their various language (**1977 أحمد، اليونس وعبد الله كركجي**).

I.1.2. In china

The history of phytopharmacology in China dates back to the fifth millennium BC. It is believed that the first god to heal in ancient Chinese history was the emperor Chen-ning, who wrote a letter about medicinal plants in **4700 BC**, testing hundreds of herbs for therapeutic value. This letter is considered to be a timely description of **250** species of plants, and all subsequent medical literature about plants was based on the writings of this author **(2006، ميليسنت).**

I.1.3. In greeks

The greeks learned a great deal about herbal medicine from their ancestors, who were Sumerian, egyptian, and other. In this field, many scientists have emerged, chief among them the renowned physician Abu Karat, the scientist who established botany. It has over a thousand volumes and is the most well-known plant book in the world.

It contains descriptions of every plant, their benefits, and their applications **(سالم جابر ، 2008).**

I.2. Definition of medecinal plants

Medicinal plants are all plants that contain one or more substances that can be used for therapeutic purposes or that are precursors in the synthesis of useful drugs (**Sofowora, 2010).**A medicinal plant is one whose organs, such as the leaf or bark, have healing properties when used at a certain dosage and in a precise way **(Charbrier, 2010).**

I.3. Uses of medicinal plants

The applications of medicinal plants are numerous, such as:

- Those used to treat rheumatic infections, blood pressure, and arterial stiffness
- Some of these plants' seeds include enduring oils that are used to install specific pharmaceutical and medical preparations.
- Making cosmetics, including cream powders, soaps, fragrances, and odors.
- As well as beverages like ginger and thyme that are offered in cafesand stores.
- The poisons found in aromatic and medicinal plants are used to make pesticides (insecticide, fungicide).
- It is used as a flavoring agent in beverages, foods, or scents.
- Its importance to the environment: medicinal plants play an important role in improving the environment, such as by improving the physical and chemical properties of the soil and increasing their fertility.
- Industry field: insecticide manufacturing and extracting oils from plants such as castor oil, sesame oil, and sunflower oil, where these oils are also included in the pharmaceutical and food industries **(Bèkro et *al.*, 2007).**

I.4. Classification of medicinal plants

There are many reliable methods in classifying medicinal plants as follows

I.4.1. Morphological classification

This classification depends on where the active substance is located in different plant parts, either in the whole plant, in the leaves, or in the flower.

- **Plants used in their entirety**: Plants with effective chemicals are present in different plant parts without the tendency to gather in a plant organ without the other, such as a black pine tree.
- **Plants using their flowers**: Where the active substance is found in flowers such as cloves, saffron, and roses.
- **Plants Using Their Fruits:** Contains active substances in their fruits, such as vanilla fruits.
- **Plants using their seeds:** These are plants whose seeds contain effective substances such as black mustard, linen, and castor.
- **Plants using roots**: Plants with mutated ground stems or sedentary roots, such as ginger and pulp tubers **(Thomas, 1998).**

I.4.2. Physiological or therapeutic classification

It is also called pharmaceutical classification and is based on the physiological, medical, or therapeutic effect without taking into account the chemical or synthetic quality of the substance.

There are many types, the most important of which are:

- **Laxative plants:** Such as castor, date, and tamarind.
- **Narcotic plants:** Like willow, poppy, and Indian hemp.
- **Cardiac activating plants:** Digitalis purpurea, onions, and green tea.
- **Repellent plants for abdominal gases:** Mint, basil, cumin, and coriander.

- **Antibiotic plants:** Such as garlic and camphora **(Thomas, 1998).**

I.4.3. Chemical classification

Plants are arranged according to the nature and concentration of the chemical composition of active substances in the plant. The plant can contain more than one active substance, and the medical plants, according to this system, are divided into:

- **Alkaloids Plants:** Like: poppy, tobacco, and coffee.
- **Glycoside plants:** Such as mustard, aloe vera.
- **Plants of Aromatic Oils:** In this type, we have mint, chamomile, jasmine, thyme, cumin, anise, and coriander.
- **Plants of resin:** Such as pine and ginger.
- **Plants of fixed oils:** Such as sunflower, castor, linen, and olive **(Thomas, 1998).**

There are other types of classifications that we mention briefly, which are classification by order or alphabetical division, in which plants are sorted by the first letter of their scientific name:

- **Scientific classification:** According to division, class, rank, family, tribe, and sex.
- **Commercial Classification:** Depending on the applicable commercial considerations or institutions, plants are classified according to this type of classification into medical and aromatic plants, insecticide plants, and spice plants **(Thomas, 1998).**

I.5. Principle of medicinal plant therapy

The foundation for research on the physiological or medicinal effects of any plant-based medication, by following a specific traditional recipe, the researcher can extract and purify all known active ingredients from various plants. Subsequently, they can study the chemical properties of the substance, identify its structure, and investigate its potential effects on the environment and human health. To achieve the goal, a thorough investigation of medicinal plants needs to be conducted in accordance with a deliberate technique and followed step by step.Plants are also employed asmedications in herbal medicine to control bodily processes. Practitioners of traditional Chinese medicine believe that illnesses arise from inherent imbalances in the body, which force the body to constantly adjust to its surroundings. Plant treatment, on the other hand, focuses on system analysis**)2010 ،الجبر(** .

I.6. Types of treatment with medicinal plants

I.6.1. Conventional method

This aims to treat diseases, and their origins may be very old, and their application is sometimes based on the benefits of long-known plants. It somehow focuses on seasonal diseases that vary from minor psychiatric problems to bile liver symptoms to digestive or skin problems **(Salehi et *al.*, 2010)**.

I.6.2. Clinical treatment

This type of care is meant to be used in conjunction with traditional medicine, where patients receive lengthy treatment followed by close monitoring. The goal is to investigate the efficacy of medicinal plants through experimentation and create novel, therapeutic medications while adhering to dosage and timing guidelines **(Chabrier, 2010)**.

I.7. Source of medicinal plants

Medicinal plants can be obtained from two main sources:

- **The first source is wild plants:** Plants are found in nature and collected from the wild, and these plants are usually collected in the summer as many species grow in valleys, plains, and forests.

- **The second source is cultivated plants:** These plants are cultivated in the agricultural areas allocated to them, and herbs and plants are collected when they are mature. Pharmaceutical companies or investment institutions also establish private farms to produce specific varieties required in local or international markets in certain quantities) **2006، محمود صالح ومحمد الحسن).**

I.8. Importance of medicinal plants

Medicinal plants are economical and inexpensive. Since ancient times, medicinal plants have been used to treat many different diseases and health conditions and are of great importance in alternative and traditional medicine. Medicinal plants contain a large number of effective chemical compounds that contribute to the treatment of diseases naturally and safely. In many countries, medicinal plants are given a lot of attention because they are one of the main sources of active ingredients utilized as raw materials or extracts in medicine manufacture. Medicinal plants are thought to be the most important substance strategy in the pharmaceutical industry because they can produce some chemical compounds that are thought to be the nucleus for the chemical synthesis of certain pharmaceutical materials, increasing the need for many quantities in the industry. In addition, they compete with pharmaceutical plants andmanufactured drugs available on the market **(2014 ، مخدمي)**.

I.9. Common errors when using medicinal plants

- Choosing contaminated medicinal plants: It must be ensured that plants used for treatment are free from toxins and contaminants.
- Leaves and flowers lose their medical benefits when boiled rather than soaked in boiling water.
- Pregnant and nursing women who consume herbal recipes run the risk of developing high blood pressure, diarrhea, and occasionally even abortion.
- Continuously consuming herbal tea without limits may result in adverse effects due to the presence of potent compounds that can harm human health, including neurological disorders and cognitive decline.
- Ignoring the herb's active component and taking haphazard dosages can have detrimental effects.

- Medicinal plants should be stored properly. They should be stored in sealed containers and in a cool, dry place to maintain their quality and freshness **(بوخبتي حبيبة، 2010).**

I.10. Collection of medicinal plants

- **Roots:** The collection process takes place in the spring or autumn, just before the start of the growing season. For perennial plants, pruning is typically done in the second or third year. Before drying, the roots are cleaned with regular water to remove any dirt or sand buildup **(Rubin, 2004).**
- **Tubers:** Grow underground. Among the most used tubers are African potato tubers **(Gurib-Fakim, 2006)**.
- **Phloem**: It's also called rhytidome. The combination process is usually done in the spring **(Gurib-Fakim, 2006)**.
- **Wood:** Plant fabric, which is rarely used and is typically chopped into small pieces, gives plants mechanical support **(Rubin, 2004).**
- **Stems:** To grow and live, the plant needs leaves and stems, where all the leaves and developing peaks of the plant are processed at a time when they are very rich in active ingredients. At this time, the photosynthesis process is in a more active state in the spring **(Rubin, 2004).**
- **Flowers:** Flowers are different from the rest of the plant, where you need great precision and care in choosing the right time and generally collect flowers before or once they start flowering, like chamomile and jasmine **(حجاوي و الكل، 2004).**
- **Flowering Peaks:** Means lush stems and is usually aromatic, such as mint and lavender **(Rubin, 2004).**
- **Fruits: Y**ou might use the whole fruit, and sometimes you just use fruit peels like pomegranates, and if it's a diet, that's gathered at maturity or a little before it, like berries **(Rubin, 2004).**
- **Seeds:** It is usually used with fruits, and sometimes it may be used alone, and the combination process is done after maturity. If it is present within bloated

fruits, it is not necessary to wait until the latter automatically swells like linen and mustard **(Rubin, 2004).**

I.11. Factors affecting the harvest of medicinal plants

- **Quantity of active substances:** Depending on the plant's growth stage, the time of day and night it is harvested, and the season it is picked, varying amounts of active compounds are collected from plants. It is ideal to harvest datura early in the morning, for example, as studies have shown that the plant produces twice alkaloids in the morning before the sun appeared as it did in the afternoon.
- **Quality of active substance:** The quality of the active ingredient is just as crucial as its quantity when determining the optimal time for plant harvest. For example, colchicum plants. However, we observe that in the fall, this material totally disappears therefore, the plants that are gathered at this time are used for food.
- **Age of the plant:** The stages of growth and life of the plant have a major impact on the amount, caliber, or makeup of the active ingredient in the plant. Certain perennials have been seen to possess varying amounts of beneficial substances based on their age, which prolong their lives before gradually diminishing after a specific number of years **(حجاوي و الكل.، 2004)**.

I.12. Factors that determine the production of medicinal plants

- **The Soil:**The size of soil granules has a significant impact on the degree of moisture retention, and there are medical plants where the percentage of active substances is lower the more moisture in the soil, and there are many medicinal plants that produce volatile oils whose active substances are not affected by pH change, such as mint.

- **Temperature:** Volatile oils increase in many medicinal and aromatic plants as a result of increasing air temperatures, while fixed oils such as flax oil, castor oil, and sunflower oil increase in their percentage in plants at low temperatures.

- **Light:** Some plants give an effective amount of substance when exposed to a long lighting period, such as mint.
- **Geographical location:** It has a clear effect on the composition, quantity, and quality of active substances in cannabis and starch products.
- **Terrain:** Terrestrial Terrestrial terrain has an important role to play in determining the quantity and quality of the production of active substances. There are medical plants that give a high percentage of active substances if they grow in high places above the surface of the sea, such as tea and pine. There are also plants.That are better produced when they are in lowlands, like sugarcane.
- **Water:** Water is essential for plant growth. Provide water suitable for watering fields of medicinal plants from important determinants in production, such as wells or rivers **(Alaa Hashim, 2018)**.

I.13. Primary and secondary metabolite

I.13.1. Primary metabolite

They are compounds or essential molecules that are involved in primary reactions and have a physiological function in the plant. Amino acids, fats, nuclear acids, carbohydrates, proteins, and sugars are important examples of initial metabolism that go directly into natural growth, development, and reproduction in the organism or cell)**2014، مخدمي).**

I.13.2. Secondary metabolite

Plants are able to produce a large number of compounds, and these compounds are not produced directly during photosynthesis but rather result from chemical reactions**(Richter, 1993**). Plant secondary metabolites are particles indirectly necessary for plant life, unlike primary metabolites that feed the main pathways of basic metabolism. However, these secondary metabolites play an important role in adapting plants to their environment. So they are very actively involved in the tolerance of plants to various attacks and pathogens, including insect predation, drought, and UV radiation **(Colmar, 2007)**.It is also considered the second line of defense for plants and has great importance for humans as it is used in many fields, especially industry, such as the pharmaceutical industry, cosmetics industry, food industry, and others (**احمد لطفي ونس، 2020)**.

I.14. Classification of secondary metabolism

I.14.1. Alkaloids

Its structure contains a lot of rings and is one of the most important natural products produced by medicinal plants, which are complex nitrogen bases (**Fig1)**.Are defined as heterocyclic nitrogen compounds that are heterogeneous and have an alkaline character **(Bendif, 2017**).These compounds can be divided into three types:

- **Real alkaloids:** These compounds represent the largest proportion and are necessary because of the nitrogen atom found in the nucleus in heterogeneous annularform.

- **Primary alkaloids:** It is derived from amino acids and is often called: biological amines.

- **Pseudo alkaloids:** Do not derive from amino acids; they are often necessary. Alkaline asteroids and purines are the main representatives of this alkaline category **(Tass M-A.EtYahi D, 2022).**

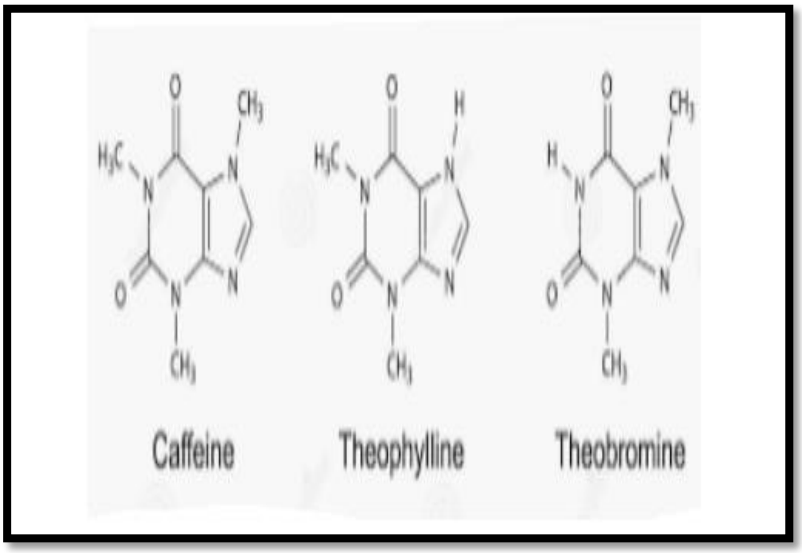


Fig 1: Some types of alkaloids **(Bruneton, 2009).**

I.14.2. Phenol compounds

Are present in all parts of the plant, including roots, stems, leaves, flowers, pollen, fruits, seeds, and wood. These compounds constitute the largest group of secondary metabolites and are widely spread in groups **(Langlade, 2010).** The phenolic acids are separated into two distinct large groups:

- Benzoic hydroxy acids (C6-C1) derived from benzoic acid (**Fig 2).**
- Cinnamic hydroxy acids (C6-C3) derived from cinnamic acid **(Fig 3).**

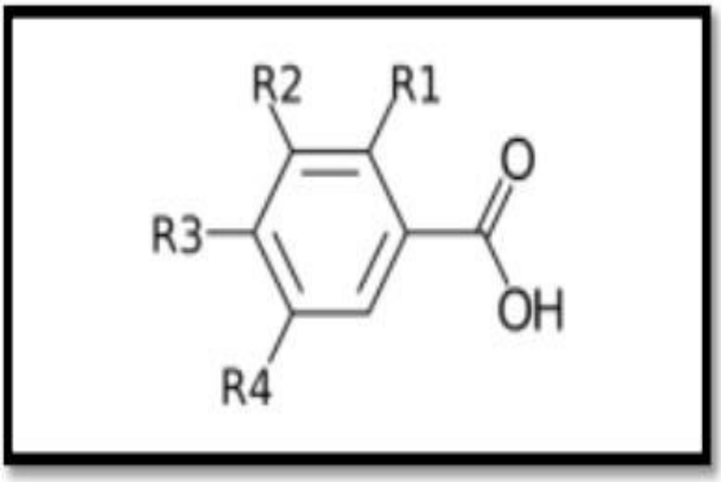


Fig 2: The structure of benzoic hydroxy acids **(Charik S. EtKadri Y, 2020).**

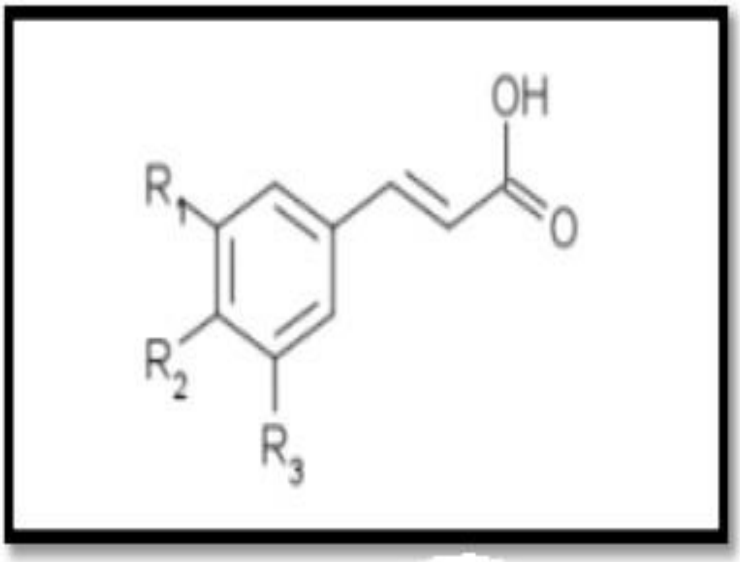


Fig 3: The structure of cinnamic hydroxy acids **(CharikS. Et Kadri Y, 2020).**

I.14.3. Tannins

It is divided into two main sections: hydrolysable tannins and condensed tannins. They can also combine with proteins, minerals, alkalis, and sugars their molecular weight is between **500** and **3000 (Frutos *et al*., 2004).Fig 4**: represents the chemical structure of hydrolysabletannins **(A)** and condensed tannins **(B**).

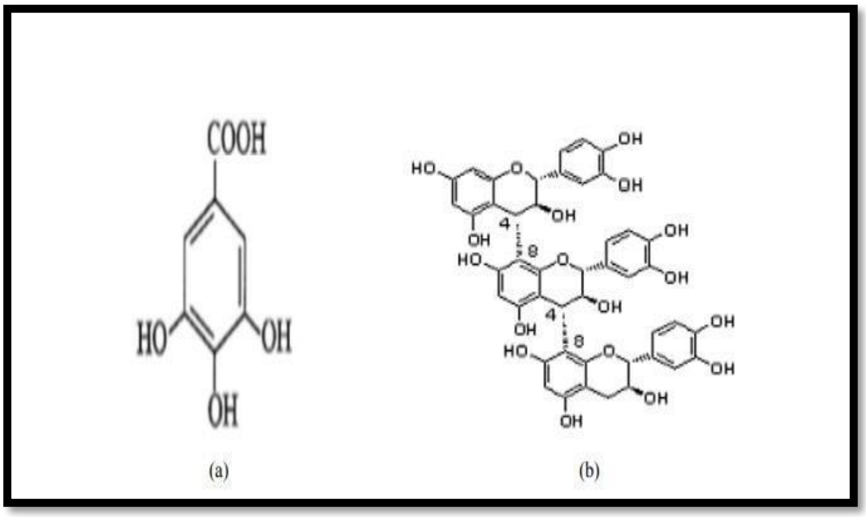
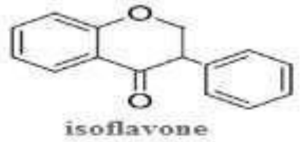
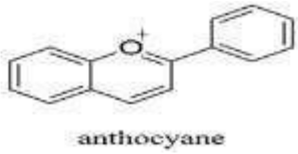


Fig 4: Chemical structure of hydrolysable tannins **(A**) and condensed tannins **(B)** **(Bruneton, 2009).**

I.14.4. Flavonoids

Flavonoids are dye substances that dissolve in water. It contributes to the coloring of plants. Flavonoids are the primary group of polyphenols, with more than 4,000 different compounds in the plant kingdom. The common chemical form of flavonides is propane biphenyls, which consist of two aromatic loops that are connected to three atoms of carbon **(Table 1)**. Flavonoids are widely found in plant-base foods such as fruits, vegetables, beans, green tea, and cocoa **(Labani, 2021–2022).**

Table 1: The main classes of flavonoids (**Narayana *et al*., 2001**).

Classes	Structureschimiques	Propriétés
Flavones		Neutralisationdesradicauxlibres
Flavonols		Antihistaminique Anti-inflammatoireAntioxydants
Flavanones		
Isoflavones		Sourcedephyto_ œstrogène
Anthocyanes		Antiseptiqueurinaire

I.14.5. Quinones

Are a structurally diverse class of phenolic compounds and are aromatic compounds, consisting of a benzene nucleus where four atoms of hydrogen are replaced by two oxygen atoms that eventually form two bonds of carbonyl**(Fig 5)**. The simplest member of the quinone family is benzoquinone, which has been obtained through quinone acid oxidation. Whole, quinone-rich plants are used to treat different diseases. Electrons are transported through the inner mitochondrial membrane **(Maria Jose A.M. Et Paulina B.B., 2005)**.

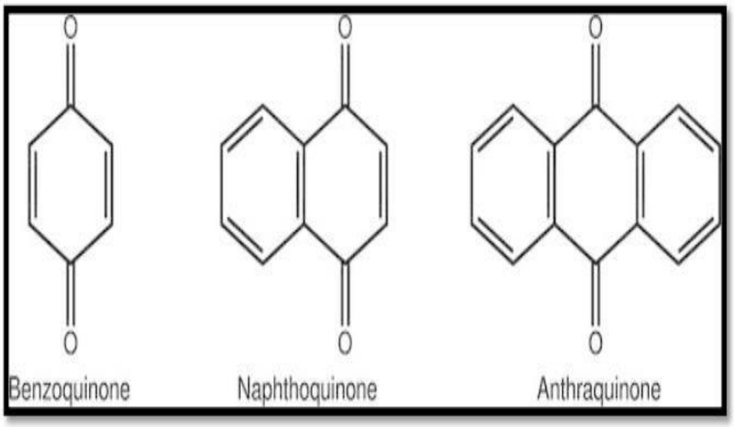


Fig 5: General structure of quinones **(Bruneton J., 2008)**.

I.14.6. Coumarins

They are natural organic and aromatic substances made up of nine carbon atoms. In addition to this, they play a role in disease and pest resistance and UV tolerance **(Graciliana et al., 2016).**

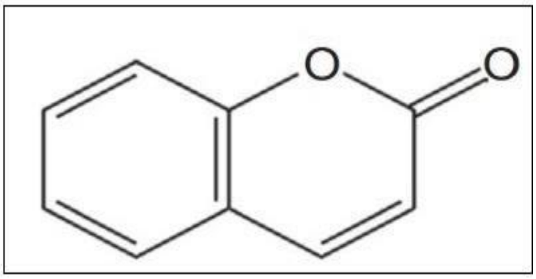
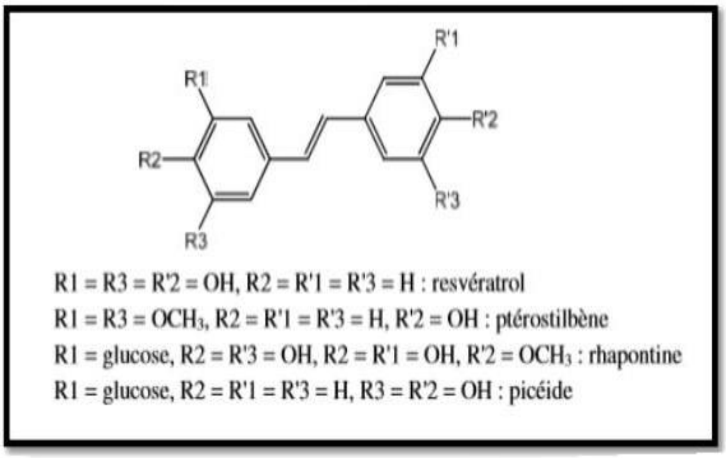


Fig 6: Basic structure of coumarins **(Ali hosseini, 2016)**.

I.14.7. Stilbenes

It's a phenolic compound containing at least two aromatic nuclei associated with each other with a double bond **(Fig 7)**, and it is also a class of organic compounds containing a stilbene-type petrol nucleus **(Chouiha O. Houacine A., 2018)**.



R1 = R3 = R'2 = OH, R2 = R'1 = R'3 = H : resvératrol

R1 = R3 = OCH_3, R2 = R'1 = R'3 = H, R'2 = OH : ptérostilbène

R1 = glucose, R2 = R'3 = OH, R2 = R'1 = OH, R'2 = OCH_3 : rhapontine

R1 = glucose, R2 = R'1 = R'3 = H, R3 = R'2 = OH : picéide

Fig 7: Basic structure of stilbenes and its main types **(Chouiha . Et Houacine , 2018).**

I.14.8. Saponins

It is an organic compound that is found naturally in plants. It is an organic substance that resembles alkaloids in structure and belongs to the alkaloids class. Cortisone is made from chemicals derived from saponins. It is considered one of the basic materials used in the manufacture of soap and detergents **(Richard, 1998**).

I.14.9. Anthocyanins

Are pigments of plant origin belonging to the flavonoid family and are responsible for the red, blue, or purple color of many fruits, vegetables, and flowers. They are found in many foods, such as cherries and blackberries **(Bruneton, 2009).**

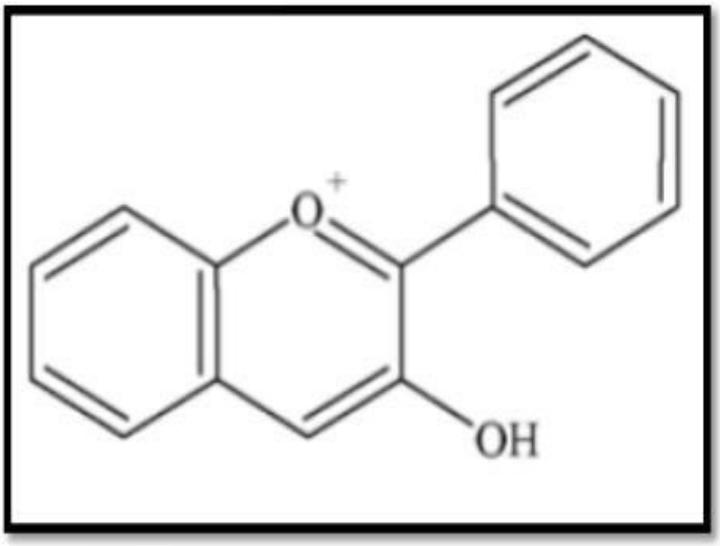


Fig 8: Basic structure of anthocyanins **(Boudjouref M., 2011)**.

I.14.10. Terpenoids

It is a multi-gene compound that belongs to one of the biggest known classes of secondary metabolites found in plants. It is also a compound that does not dissolve in water **(Charik S. Kadri Y., 2020).**

CHAPTER 2

Urtica dioica

Aloe vera

II.1. Urtica dioica

II.1.1. Brief history

The use of stinging nettle dates back to the **460th** century BC in Greece, where it was used in some herbal remedies to relieve pain. Greek civilization was not the only one to use the herb for medical purposes. Roman soldiers also placed leaves directly on the site of pain to alleviate their intensity.This is not the only use of the plant,as it has been introduced into everyday foods in the form of salad soup or by boiling the plant and using it as tea a herbal drink to alleviate menstrual pain in women and stomach pain. Over time, new therapeutic properties of the nettle were discovered as it was used to treat anemia, eczemic and kidney disease, bladder infections,joint pain relievers, and the use of leaves to help stop nosebleeds, as well as to introduce the plant into the manufacture of natural hair and face recipes as well as natural shampoos and other recipes still used today (**أيت عامر وغالتي، 2022**).

II.1.2. Definition

It is a grassy plant that grows in tropical and moderate regions of the world. The nettle belongs to the plant species ***Urticacea*** and has two main categories: *Urtica dioque* L and *Urtica urens* are drived from the Latin act urée, which means combustion, while *dioica* means that there are two houses that usually contain female or male flowers. Nettle is characterized by its leaves, which typically cause a burning sensation upon contact. It is a medicinal plant rich in minerals and anti- inflammatory (**أيت عامر و غالتي، 2022**).

II.1.3. Geographic location

Originating in the chilly climates of Northern Europe and Asia, stinging nettle is now found around the world, but it is more prevalent in Northern Europe than in Southern Europe, North Africa, Asia, or the two American continents (**Ait Haj said et all., 2016)**.When conditions are ideal, the stinging nettle plant can grow up to **1.5** meters long in ozote-rich soil. Nettles favor human-served or human-lived soil because of its abundance of organic waste and residue, which can be found in homes, gardens, forest margins, and areas around dams **(Bertnard B, 2010)**.

II.1.4. Plant description

There are two basic types of nettles: small nettles up to about **50 cm**, and large nettles that are more than **1** meter. Nettle has a square-sided stem that is easy to break. Its serrated leaves are large in the shape of a heart, and the body of the nettle plant (leaves and stems) is also characterized by the presence of delicate bristles that cause pain and burns when touched. Its small green flowers are cluster-shaped, bottom-oriented (**عبد النور حسان، 2008**).

II.1.5. Plant taxonomy

According to the classification published by **(Afif Shaouche, 2015**).*Urticadioica* L is evaluated as follows:

Kingdom: Plantae.

Division: Magnoliophyta.

Sub-division: Spermatophyta.

Class: Magnoliopsida.

Ordre: Urticales.

Family: Urticacea.

Genus: Urtica.

Species: *Urtica dioica* L.

Fig 9: *Urtica dioica* L plant **(Asgarpanah et Mohajerani, 2012).**

II.1.6. Denomination

Latin name: *Urtica dioica* L.

French name: High nettle, dioecious nettle, stinging nettle, large nettle.

English name: Greater Nettle, Nettle, Common Nettle, Tall Nettle, Slender Nettle, Stinging Nettle **(Camille et Christine, 2009).**

II.1.7. Reproduction *Urtica dioica*

It is done in two ways***:***

II.1.7.1. Sexual reproduction

This type of reproduction includes memorandum flowers and feminine flowers portable on different stems. The wind is responsible for pollination, and the flowering phase occurs in June, September, and October. Following fertilization, a fully-lit plant can yield roughly **20,000** seeds, which do not experience a dormant phase and can sprout five to ten days after reaching maturity, as well as survive for many years in the soil **(Crémer et al., 2008)**.

II.1.7.2. Asexual reproduction

The process involves creating copies that quickly spread over wide areas. These copies are typically composed of roots (subterranean, ephemeral stems that can branch out and give rise to new stems) or stems (creeping stems created by nodes leading to the appearance of new plants). Because the nettle releases its buds into the light, it may grow longer and quicker than other plants, which prevents other plants from growing **(Crémer *et al*., 2008).**

II.1.8. The reaping of *Urtica dioica*

Aerobic parts of nettle are reaped immediately before flowering or soon after, and it is best to do this process on a shaded day and be dry while keeping wet plants. During the weeks before harvesting, plants are inspected periodically and continuously to avoid picking at-risk leaves from insects **(Sybille, 2018).**

II.1.9. Effective elements of *Urtica dioica*

This plant contains a substance called secretin, a yeast that rich in nutritional elements such as iron, magnesium, potassium, calcium, sylesium, and vitamins, the plant is considered one of the richest in vitamin C (**عبد النور حسان، 2008**).

II.1.10. Benefits of *Urtica dioica*

- Nettle helps strengthen and increase red blood pellets and their composition, thereby healing from anemia and heart weakness, and reducing increased pressure in atherosclerosis.
- Regulates digestion in the body, treating digestive organs, infectious ulcers and intestinal and also It relieves haemorrhoids' pain.
- Treating First-degree burns only and treat skin redness, stops nosebleeds.
- Nettle plants vinegar is used to treat hair loss by rubbing through a cloth in the skin of the head every day, and is one of the successful plants in treating gum irritation and mouth, by means of gurgling methods.
- Boiling nettle leaves in water help treat infectious ulcers, also treats diabetes.
- Nettle treats malignant cancerous sores and regulates menstruation.
- It also contributes to the treatment of acne when placed opically on the skin (**عبد النور حسان، 2008**).

II.1.11. Uses of *Urtica dioica*

II.1.11.1. Medical field and alternative medicine

Compared to other medicinal plants, the use of nettle in medicine is thought to be minimal, but many studies have been done on it. One example in Germany is the licensing of nettle in drugs that treat the urinary tract as well as in some cancer drugs. In the field of alternative medicine, nettle tea is used as a reliever for stomach pain and menstruation **(Tigist, 2017)**. In addition to extracting creams made from it to treat hemorrhoids and reduce blood sugar, this plant also treats kidney and allergic problems, improves digestion, treats skin problems, and relieves prostate pain in the body **(Yasaman *et al*., 2022)**.

II.1.11.2. Field of cosmetology

Nettle is widely used in the cosmetic field and is used in tea form. Or capsules for detoxification, nettle is manufactured in scalp processing. Nettle vinegar is very useful for women's skin gloss and for strengthening eyelashes. Many brands have used it as an essential factor in their products, and some have launched a whole series of them. In addition, nettle is used in perfume as a refreshing herbal fragrance **(Johanne, 2022)**.

II.1 .12.The Vegan description of *Urtica dioica*

II.1.12.1. Roots

The nettles have long roots that allow them to form colonies and penetrate deep into the soil. These creeping roots range in thickness from **1** to **5 mm** and are equipped with precise, occasional roots **(2000، شافوتير والكل).**

II.1.12.2. Leaves

The nettle leaves are dark green, rich in chlorophyll, and have the opposite arrangement with serrated edges. The bottom leaves are somewhat white, and the top leaves are more symbolic. Veins stand out on the bottom side of the sheet **(Fig 10)**, and the leaf feature is also covered with innocuous soft hair and thin hair **(Boyrie J, 2016)**.

Fig 10: ***Urtica dioica*** leaf **(Reaume, 2010).**

II.1.12.3. Stems

The stem is robust, erect, hairy, unbranched. It is green in color when the plant is young, and purple-red when it is older **(Said *et al*., 2016).**

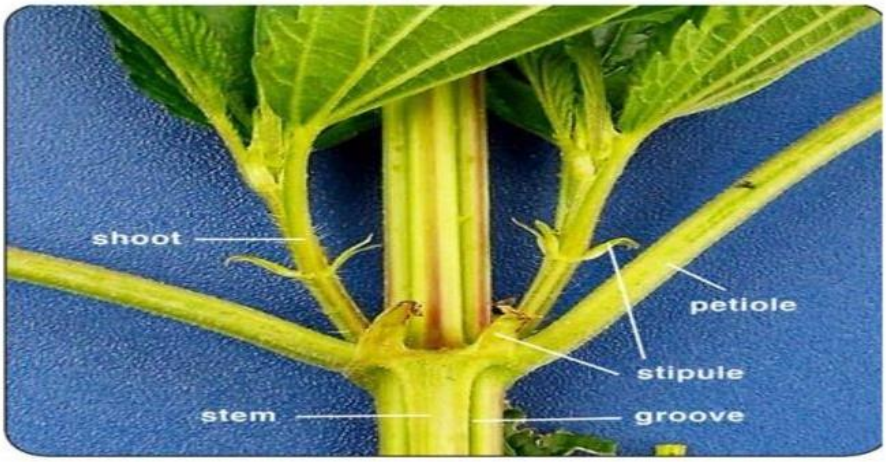


Fig 11: *Urtica dioica* stem (**Reaume, 2010).**

II.1.12.4. Fruits

Fruits are usually surrounded by small green leaves: two narrow external papers, two broader and longer papers, and the fruit is **1** to 1.5 **mm** long and **0.7** to 1 **mm** wide **(Juliette, 2016).**

II.1.12.5. Stinging bristles

Nettle covers stinging bristles in order to protect the plant from animals that may feed on or run over them. These bristles are conical in shape and solid (**Fig 12),** divided into two parts. Stinging hairs contain a real chemical cocktail rich in histamine, formic acid, acetic acid, acetylcholine, butyric acid, leukotrienes, and serotonin, as well as other irritant substances **(Draghi, 2005)**.

Fig 12: Stinging bristles of *Urtica dioica* **(Asgarpanah et Mohajerani, 2012)**

II.2. Aloe vera

II.2.1. Brief history

It is a legendary plant known and very important for more than **5,000** years in many different and remote regions of the world, such as Southern Europe, Asia, North Africa, America, and the Far East. In fact, the use of this plant is very old and also historical, as it is used for preventive and therapeutic purposes for many human and animal diseases, and its importance and uses have been noted in many writings and artworks left by various ancient civilizations at least **5,000** years ago. Indeed, history attests to its many and varied applications in the field of medicine in all ancient and modern historical civilizations **(Linda et Michelin, 2018).**

II.2.2. Etymology

The word *Aloe* is derived from Latin aloi αλόη Greek. It may be derived from Arabic "aluat" or Hebrew "alua," which means the bitter thing. The surname *vera* is also derived from fem.vera, which means "real or authentic. Aloe vera was very well known in ancient times, especially in Greek-Roman civilization **(Roullier, 2015)**. Derive the name of *Aloe vera* from the Arabic word Alloeh, which means bitter matter. While vera in Latin means liquid **(Amar et Resham, 2008)**.

II.2.3. Geographic location

Aloe vera grows naturally in North and East Africa especially in Uganda and in South Africa, as well as in Turkey and the Canary Islands of South America, Central America, the southern United States, such as California, Texas, Arizona, even Florida, Asia (India), South China, and Australia **(Rahoui ,2019)**.

II.2.4. Plant taxonomy

The ***Aloe vera*** is classified by (**cronquist, 1981)** as follows:

Kingdom: Plantae.

Division: Magnoliopyta.

Class: Liliopsida.

Order: Liliales.

Family: Aloaceae.

Genus: Aloe.

Species: ***Vera*****.**

Fig 13: The *Aloe vera* plant **(Amar and Resham, 2008).**

II.2.5. Common species

The genus of *Aloe vera* contains **300** types, but there are three main types mainly used as medicinal herbs, from which we state the following according to (**1986، ابوزيد).**

II.2.5.1. Aloe vera

Also known as ordinary aloe vera, an evergreen plant contains a range of vitamins, minerals, and amino acids. Whose leaves collect on the soil surface and contain a set of pointed and serrated thorns.

II.2.5.2. Aloe perryi

Also known as African ***Aloe vera***, it is very similar to the natural species, but its leaves are short, green, and reddish with orange flowers.

II.2.5.3. Aloe ferox

It is also called the Asian cactus, and one of its advantages is that it has a long leg up to **3.5 m** in height, while the leaf is **60 cm** long and **5.3 cm** wide. The top surface of the paper is dark green. The bottom surface is teal**.**

II.2.6. *Aloe vera* gel

Aloe vera gel contains many organic acids (**Fig 14)**, such as malic acid, lactic acid, salicylates, isocitric acid, succinic acid, and salicylic acid **(Pelley and Wang, 1993)**. The *Aloe vera* gel also contains a range of minerals, from which we mention the following: Potassium, calcium, magnesium, manganese, copper, and anti-oxidant selenium **(Bouchey et Gjerstad, 1994)**.

Fig 14: *Aloe Vera* gel

Website 01: (https://www.minedbp.com/featured/forever-living-products-for-sale.php).

II.2.7. Medical uses of *Aloe vera*

II.2.7.1. Use *Aloe vera* as an immune system stimulus

Aloe vera contains some substances that stimulate the immune response by stimulating the cells of macrophages, t-cells, and b-cell spleen cells, and thus these cells stimulate the production of IL-6, IL-2, and IL-1 (**Leung *et al*., 2004)**.

II.2.7.2. Treatment of burns andwounds

Aloe vera has many benefits: it is widely used in the treatment of various skin wounds, especially for diabetics, directly stimulating the activity of both macrophages and fibroblasts that increase collagen and procholagen and are useful in healing burns, especially from the second degree **(Yates *et al*., 1992; Heggers *et al*., 1996).**

II.2.7.3. Use of *Aloe vera* as an anti-cancer

Some of the strongest anti-cancer and immune-stimulating compounds found in aloe vera are carotene, germanium β, lectin, arginine, and carotene β. Research has indicated that these compounds impede the proliferation of cancer cells and augment the quantity of T-4 and T-8 cells, which eradicate cancer cells, particularly those pertaining to leukemia **(Amusan *et al*., 2002).**

II.2.8. *Aloe vera* components

The plant is rich in many natural substances that promote health (as shown in the table belew **(Table 2**). *Vera* contains about **98.5%** water, while the gel contains about **99.5%** water. The **0.5–1%** remaining contains about 250 activecompounds **(Eshunet He, 2004).**

Table 2: Represents the Active substances found in *Aloe vera* gelinshort

(Hamman, 2008: Josephet Raj, 2010).

Vitamins	B1,B2,B6, Choline,β-carotene,A,B,C, E,Folicacid.
Proteins	Lectins, Lectin-likesubstances.
Polysaccharides	Mannan , Acetylated mannan ,Glucomannan , Galactan , Cellulose, Pecticsubstance.
Anthraquinones	Aloe-emodin, Aloetic-acid,AloinAandB,Emodin,Chromones.
Enzymes	Alkaline phosphate,Amylase,Carboxypeptidase,Catalase,Lipase,Bradykininase.
Monosaccharaides	Mannose,Aldopentose, Glucose, Rhamnose.

II.2.8.1. vitamins

- **Vitamin A** (Carotene): Improves vision, promotes skin and bone health, and protects root cells.
- **VitaminB1** (Thiamin): Is essential for tissue growth and energy production.
- **VitaminB2** (Riboflavin): Has joint action with vitamin B6 for blood formation.
- **VitaminB3** (Niacin): Regulates metabolism.
- **VitaminB6** (Peridoxin): Has a joint action with vitamin B2 for blood formation.
- **VitaminB9** (Folic acid): Anti-anemia and regenerate red blood cells.
- **Vitamin B12** (Cyanocopalamin): Necessary for metabolism, an important energy factor, and enhanced red blood cell formation.
- **Vitamin C** (Ascorbic acid): Participates in vitamin E, fights infections, stimulates the immune system, and keeps the skin healthy.
- **Vitamin E** (Tocopherol): Vitamin C protects the cell membrane and helps control and treat infection (**Michayewi, 2013)**.

II.2.8.2. Enzymes

- **Amylase**: Decompose starch into dextrin and then maltose.
- **Bradykinase**: Stimulates the immune system and is also considered pain relief and anti-inflammatory.
- **Catalaz**: Prevents the accumulation of water in the body.

- **Cellulase** : Helps digest cellulose.
- **Nucleotidas**: Stimulates the hydrolysis of nucleotides into nucleosides.
- **Acidphosphatate**: Is an indicator of prostate cancer.
- **Alkalinephosphatase**: Regulator of liver function.
- **Caprylicacid**: Is used in the treatment of fungi.
- **Lipaz** : Facilitates digestion **(Surjushe et *al*., 2008).**

II.2.8.3. Minerals

Aloe vera is an extremely valuable plant that contains over **20** metals mineral, all of which are essential to human health. These minerals include:

- **Calcium**: Developing muscle, heart health, and the makeup of teeth and bones.
- **Magnesium**: Works with manganese to keep the neurological system and muscles operating properly.
- **Chlorine** : An antiseptic.
- **Zinc**: Promotes the immune system, increases protein activity in the healing process, speeds up healing, and supports the health of the teeth, bones, and skin.
- **Manganese**: Fortifies bones, nerves, and tissues; it also activates enzymes.
- **Chrome**: Promotes blood sugar and circulatory system balance and aids in the metabolism of proteins.
- **Copper**: Is an essential metal required for blood composition and bodily equilibrium.
- **Iron**: Increases immunity to infections and gives red blood cells oxygen.
- **Phosphorus**: Bone growth with calcium.
- **Potassium**: Regulates fluid components in the blood and muscles.
- **Sodium**: Maintains the body’s water balance levels and transfers amino acids and glucose to cells **(Nwaoguikpe *et al*., 2010).**

II.2.8.4. Essential amino acids

Aloe vera contains **20** of the **22** amino acids necessary for humans, including **7** amino acids necessary for the proper functioning of the human body:

- **Isoleucine**: Regulates the balance of nitrogen in the body and helps regulate blood sugar.
- **Leucine**: Is responsible for muscle elasticity and energy production throughout the body.
- **Lysine**: Is the main ingredient in antibodies.
- **Methionine**: Promotes detoxification of the liver and kidneys.
- **Vinylalanine**: Is essential for the thyroid's production of thyroxine and helps reduce memory disorders, migraines, and depression.
- **Thryonin**: Contributes to immunity preservation and energy production **(Morin et Burm, 2008).**

II.2.8.5. Secondary amino acids

Aspartic Acid, Glutamic Acid, Alanine, Arginine, Sistine, Glycine, Hystedine, Hydroxyprolene, Proline, Serene, and Tyrosine **(Morin etBurm, 2008).**

II.2.9. *Aloe vera* leaves

Meaty ***Aloe Vera*** leaves have a distinctive property. They are barbed and grow these leaves in the form of a rose, arranged in a spiral. The color of aloe vera leaves green is very beautiful when sunlight (**Fig 15)**. The leaves are **80cm** long and 10**cm** wide, with edges with light yellow thorns. The smallest leaves grow in the middle of the plant, the oldest leaves outside **(Perrot et Paris, 1971).**

Fig 15: *Aloe vera* leaves **(Chun-hui *et al*., 2007) .**

II.2.10. Benefits of *Aloe vera*

II.2.10.1. In the medical side

- ✓ Enhances immune system function.
- ✓ Enhances nervous system function because it contains minerals and vitamins that maintain hormonal balance, which balances the functions of the nervous system.
- ☐ Regulates blood pressure containing low salts such as sodium and potassium **(بالطاهر و زورة، 2019).**

II.2.10.2. In The cosmetic aspect

Aloe vera juice (gel) is applied to the scalp to prolong hair, prevent hair loss, and treat alopecia. It moisturizes the skin and gives it shine **(بالطاهروزورة، 2019).**

II.2.10.3. *Aloe vera* environment

Aloe vera generally grows in semi-arid regions and is a plant that cannot tolerate harsh conditions such as excessive humidity or very high temperatures. It prefers sandy soil and can grow in nutrient-poor soil. It also tolerates drought very well but is not very frost-tolerant. It will survive at -3°C **(gurib-fakim et schmelzer, 2008).**

Chapter 3

Meterials and Methods

This experimental part of the study was conducted in the educational laboratory of the Abdelhafid Boussouf University Centre –mila under the title: Studies on phytochemical constituents of medicinal plants of two types***:*** *Urtica dioica* and ***Aloe vera.***

- **Objective of the study**

This study aims to know the morphological properties of two types of medicinal plants ***(Urtica dioica*** and ***Aloe vera***) and to compare their contents of phytochemicals in both the vegetative (upper) and the root (lower) parts.

III.1. Materials

III.1.1. Plant material

Our experimental study was conducted on two different types of plants: The first species is the nettle (***Urtica dioica***), which belongs to the Urticaceae family. The second type of thoughtful plant is the ***Aloe vera*** plant, belonging to the Aloaceae family. In this study, we used two different parts in both the cactus plant and the nettle: the aerobic part (upper part), which is the legs and leaves , and the root part (lower part).

III.2. Methods

III.2.1. Collection and preparing samples

The two studied plants were collected from two distinct areas in the Mila region in late February 2024. Nettle specimens were collected from Mila City, while aloe vera samples were obtained from Rouached Municipality. The sampled plants were processed according to the following steps:

III.2.2. Washing

The roots of the plants were cleaned in tap water to remove all impurities, dust, and soil

III.2.3. Drying

The samples were dried at room temperature in a dry, ventilated, and shaded place.

III.2.4. Morphological measurements

First, we measured the total length of both nettle and aloe vera using millimeter paper, Four duplicate samples were used for each plant type.Then we measured the length of the stem and the roots. Also, we counted the number of compound leaves in each sample and calculated the average for the four duplicates. Secondly, we determined the fresh weight of the plants. By using an electronic balance, we measure the plant parts, The samples are then placed in the oven at **70°** degrees in the oven , until completely dry to get dry weight.

III.2.5. Preparation of aquatic extract of plants

Leaves and stems were mixed together by applying 20 g of the dried plant and then adding 50 ml of tap water to the dried plant. The mixture is heated over low heat for 20 minutes until the final aqueous solution is obtained. In the same manner and quantities, repeat the process with the roots (**Fig 16.17.18.19)**.

Fig 16: Aqueous extract of ***Urtica dioica*** leaves and stems (**personal photo**)

Fig 17: Aqueous extract of ***Urtica dioica*** roots (**personal photo**)

Fig 18: Aqueous extract of ***Aloe vera*** leaves and stems (**personal photo**)

Fig 19: Aqueous extract of ***Aloe vera*** roots (**personal photo**)

III.3. Phytochemical screening

The table 3 below shows the different phytochemical screening tests and specific reagents used and their expected results:

Metabolites	Protocol	Expecte dresults
Flavonoids	Flavonoids are plant pigments. 2 ml of each extract were mixed with a few drops of hydrochloric acid (HCL) and a few drops of Ferric chloride FeCl3) in a test tube. **(Koffi *et al*., 2009)**.	The appearance of a green color indicates the presence of flavonoids.
Tannins and Phenolic compounds	In this experiment, phenolic compounds and tannins were detected by placing 2 ml of the extract in a test tube and adding a few drops of a 2% Ferric chloride solution. **(Békro *et al*., 2007**).	The appearance of a dark blue or dark green color indicates the presence of tannins and phenolic compounds.
Coumarins	Coumarin has been proven by the lactone cycle reaction. 2 ml of plant extracts were placed in a test tube. Then 3 ml of 10% sodium hydroxide (NaOH) were added. **(Diallo, 2000)**.	The appearance of a yellow color indicates the presence of coumarin.
Quinones	2 ml of the extract is placed in a test tube, and then a few drops of 1% sodium hydroxide (NaOH) are added**(Oloyede, 2005)**.	The appearance of a yellow, red, or purple color indicates the presence of free quinones.
Anthraquinone	In order to detect anthraquinone, 10 ml of	The appearance of a red loop indicated the

	extract were mixed with 5 ml of ammonium hydroxide 10% NH4OH. **(Oloyede, 2005)**.	presence of anthracquinone.
Glycosides	Low glycodides were detected using the Fehling detector. For this test, 5 ml of extract were added to 5 ml of Fehling solution after stirring and heating for 20 min in a water bath at 70 °C **(Békro et al., 2007)**.	The appearance of a red-hued deposit indicates positive interaction.
Terpenoids	To 2.5 ml of the extract, we added 1 ml of chloroform (CHCI3), and after homogenization, 1.5 ml of concentrated sulfuric acid (H2SO4) was added to the mixture **(Diallo, 2000).**	The appearance of a brown or red color indicates the presence of terpenoid.
Saponins	Saponins were proven by foam testing. In the test tube, 5 ml of extract were placed. Then shake the tube well for one minute, then let it sit for 20 minutes. **(Ayoola et al., 2008)**.	Foam height of 1cm indicates the presence of saponins.

Results

And

Discussion

III.1. Results

IV.1.1. Morphological measurements

Morphological measurements of plants are an important method of studying the physiological and biological changes of plants under the influence of a variety of environmental conditions and genetic interactions. In this study, a set of morphological measurements of nettle (Urtica dioica) and Aloe vera were used to assess the impact of different environmental conditions on their growth and development. The results of the morphological measurements of Urtica dioica and Aloe vera are shown in the following figs:

IV.1.1.1. Root length

According to fig 20 we observe a slight difference in the average length of the roots between Urtica dioica and Aloe vera. The highest recorded value for nettle plants was 10 cm, while the lowest was 9.25 cm for Aloe vera.

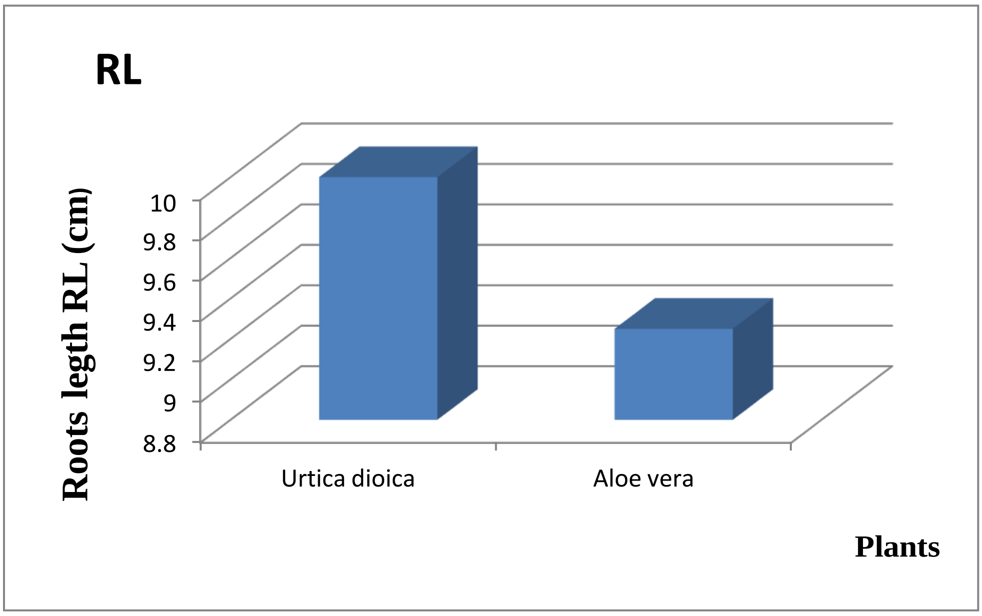


Fig 20: Average roots length measurements of ***Urtica dioica*** and ***Aloe vera***.

IV.1.1.2 .Stems length

Fig 21 demonstrate the average stems length measurements for the two plants. We observe that the tallest nettle (Urtica dioica) plant reached a height of 44 cm while the shortest Aloe vera plant measured 6 cm.

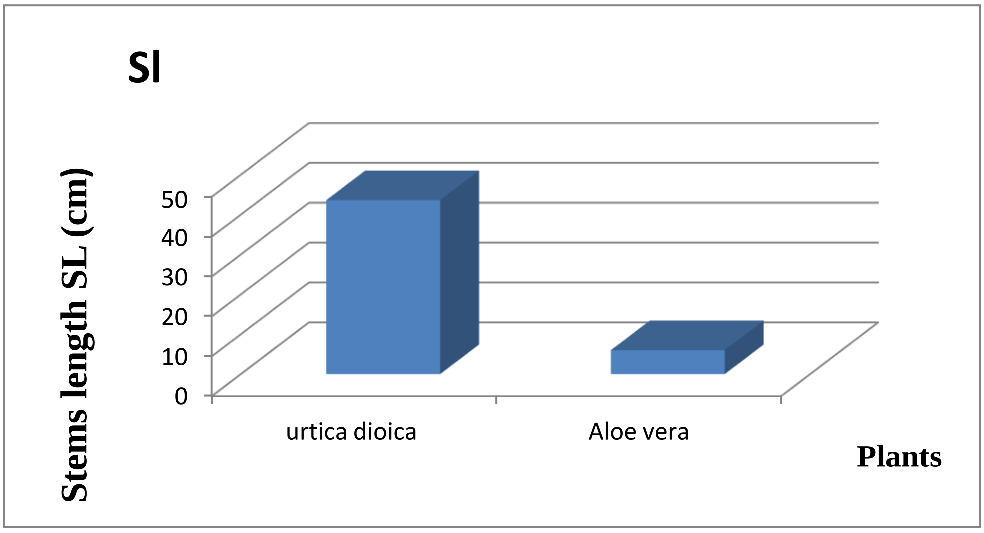


Fig 21: Average stems length measurements of ***Urtica dioica*** and ***Aloe vera***.

IV.1.1.3. Number of composite leaves

Figure 22 below represents the average number of composite leaves of the two plants. We observe that the highest average value for Aloe vera plants was 11 compound leaves, while the lowest average was 10 compound leaves for Urtica dioica.

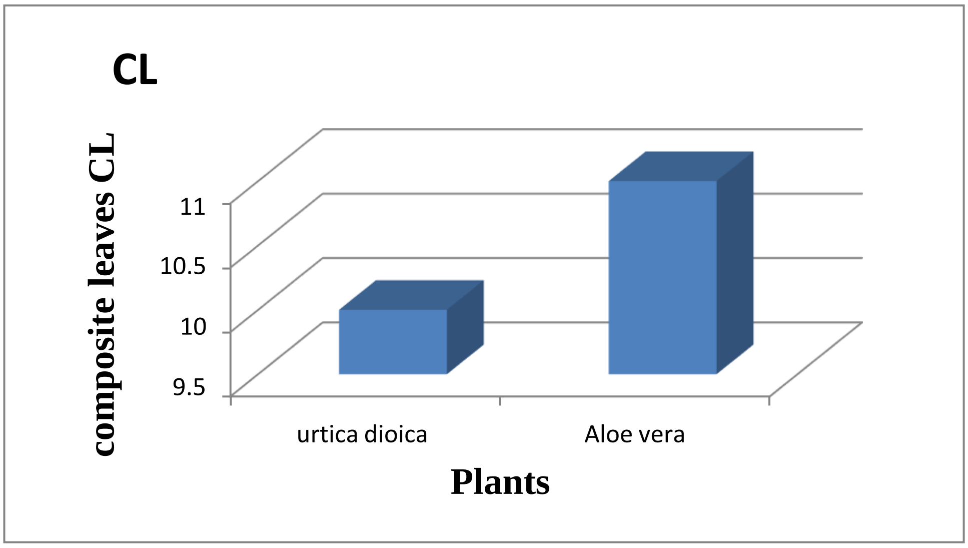


Fig 22: Average number of composite leaves of ***Urtica dioica*** and ***Aloe vera***

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IV.1.1.4. Fresh weight

Figure **23** below represents the average fresh weight of the two plants. We notice a significant difference in the results obtained, with the highest recorded value for Aloe vera being 131.85 g and the lowest recorded value for the nettle plant being 4.37 g.

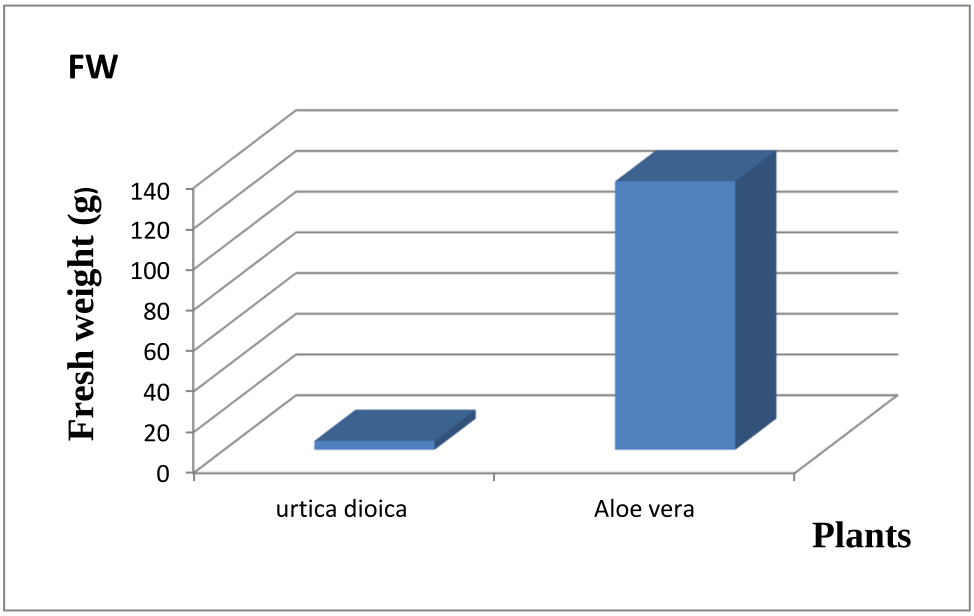

Fig 23: Average fresh weight of the ***Urtica dioica*** and ***the Aloe vera.***

IV.1.1.5. Dry weight

The Fig **24** shows the average dry weight of studied plants. We notice also a significant difference in the obtained results with the highest recorded value for Aloe vera being 69.25 g and the lowest recorded value for the nettle plant being 1.07 g..

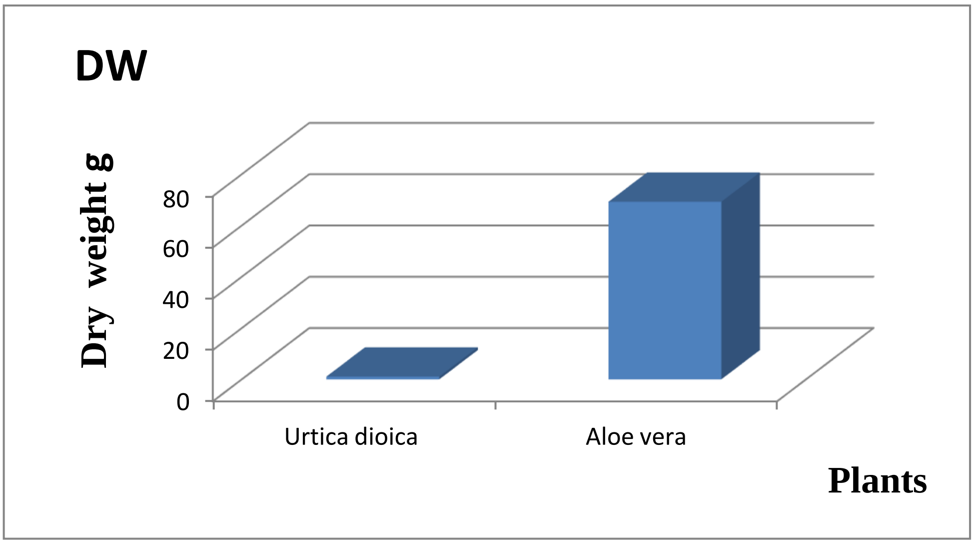

Fig 24: Average dry weight of the ***Urtica dioica*** and ***Aloe vera***.

IV.1.1.6. Phytochemical screening tests results

Phytochemical analysis is based on coloring and deposition interactions. This technique allows the identification of various chemical groups in plant extracts, such as coumarins, alkaloids, flavonoids, saponins, tannins, anthocyanins, anthraquinons, glycosides, and others. Secondary metabolites are detected using the tube reaction method. The results were classified as follows:

***Absence of the intended substance (-)**

***Low content (+)**

***Average content (++)**

***High content of desired materiel (+++)**

Table 4:

Metabolites	***Urtica dioica* (Leaves and stem)**	***Urtica dioica* (Roots)**	***Aloe vera* (Leaves and stem)**	***Aloe vera* (Roots)**
Flavonoids	 +++	 +	 ++	 -
Tannins and Phenolic compounds	 +++	 -	 -	 -
Coumarins	 ++	 -	 +++	 -
Quinones	 +	 -	 +++	 +

Anthraquinone	 +	 -	 +++	 +++
Glycosides	 +++	 +++	 +++	 +++
Terpenoids	 +	 -	 ++	 ++
Saponins	 ++	 +	 ++	 ++

Discussion

The results obtained indicate a clear variation in the morphological variables of nettle (***Urtica dioica***) and ***Aloe vera***, indicating a strong impact of local environmental. According to **(Day et al., 2002**), reproduction can reduce plant root length growth, possibly due to changes in hormones associated with plant maturity. However, under certain environmental and soil conditions, reproduction can also increase root length **(Čermák et al., 2004).**

Concerning dry weight, a higher percentage was recorded in aloe vera plants compared to nettle ***(Urtica dioica***), as one of the main reasons that leads to a decrease in dry weight in medicinal plants is water, as water greatly affects the dry weight of plants. When water is sufficient and there are suitable conditions for growth, plants can achieve greater dry weight. It is worth noting that the dry weight of the plant expresses the mass of the plant after removing all the water from it and vice versa **(Marschner, 2011).** Another reason for a decrease in dry weight is the unsuitable soil in which the plant grows, which is poor in nutrients or unable to absorb water adequately, which negatively affects the plant's growth and dry weight **(Taiz et zeiger, 2010).**

For the fresh weight of plants, its percentage was higher in aloe vera plants compared to nettle plants, this is due to the high water content of the Aloe vera plant, which is 98.5% **(Eshun et He, 2004).** Also, the morphological shape of the ***Aloe vera*** plant is much larger than the morphological shape of the nettle plant (the length of the stem, leaves, and roots), as shown in fig **14** and **12**.

As for leaves in plants, the results are very close in both plants, as studies have shown that plant size is an important factor and affects the growth rates of leaves of mature plants, and not only in perennial woody plants (**Mencuccini *et al*., 2005; VanderKleen *et al*., 2007)**, but Also in perennial herbaceous plants.

As for the stems of the plants, the results are very similar in both species. the reason for the difference in stem lengths among the studied plants is attributed to various factors .These factors include genetics factor, environment, nutrition and geological conditions.

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Plants are known to display a wide range of physiological and morphological characteristics, which can include stem length **(Valladares *et al*., 2006**).

As for phytochemical screening tests, our work has shown that ***Aloe vera*** and nettle (***Urtica dioica***) are rich in various secondary metabolites, which have attracted the attention of many researchers and scientists from ancient times to the present day. After undertaking various experiments and phytochemical tests on different parts of ***Urtica dioica*** and ***Aloe vera*** (leaves, stems, and roots), the results obtained showed significant diversity and different distributions of secondary metabolites at the level of the parts of the studied plants.

For the antenna part of the nettle **(*Urtica dioca)***, the phytochemical screening of this plant showed the presence of some compounds in very high proportion, such as flavonoids. Polyphenols and glycosides mean that the reveal was positive. Coumarins and saponins exist in moderate proportions. The percentage of anthraquinones, quinones, and terpenoids was relatively low. For the lower part of nettle plant we observe that the roots contain varying proportions of glycosides, flavonoids, and saponins. The content of flavonoids and saponins is relatively low, whereas the content of glycosides is very high. Additionally, no other chemical compounds were detected in the roots, indicating negative results.

In fact, phytochemical tests carried out by **(Safanah *et al*., 2012)** in Iraq indicate the presence of tannins, flavonoids, saponins, and alkaloids. Similarly, other work by **(Moses *et al*., 2013)** in Kenya indicates that the nettle plant (***Urtica dioica)*** is rich in saponins, tannins, glycosides, and coumarins. Another phytochemical screening by **(Afif Chaouche, 2015)** describes the richness of the leaves of the nettle harvested from the north of Algeria in tannins, flavonoids, anthraquinone, alkaloids, saponins, and glycosides. The scientists **(Franciśković *et al*., 2017)** observed the presence of flavonoids, glucosides, and other molecules, including quinones. There is another scientific study by **(toubal, 2018)** that indicates that the main chemical components of the leaves of Urticadioica are flavonoids, tannins, anthraquinons, saponins, alkaloids, coumarins, glycosides, terpenoids, and phenolic compounds.

So **(Francescovic *et al*., 2017)** describes the roots of this plant***(Urtica dioica***) as a very low source of phenolic compounds, quinones , coumarins and tannins, these results obtained correspond to our results, as there are many factors that influence the variations of secondary metabolites from plant to plant of the same species. Especially the biotic and abiotic environment and plant age, especially harvest period **(Toubal, 2018)**. The results obtained in this experiment also correspond to those recorded by (**Afif Shaouch, 2015)**, where plant chemical compounds were found. The results may vary depending on the biological location of plant species.

As for the upper part of the ***Aloe vera*** plant, the phytochemical screening of this plant showed the presence of compounds at a very high percentage, such as coumarins, flavonoids, anthraquinones, glycosides, saponins, terpenoids, and even quinones, which indicates that the detection was positive and the absence of phenolic compounds in it. As for the lower part of the aloe vera plant, we note that the roots contain a large percentage of the glycosides, quinones, saponins terpenoids, and anthraquinones.As for the lower part of the ***Aloe vera*** plant, we note that the roots contain a large percentage of the glycosides, quinones, saponins, terpenoids, and anthraquinones. As for the rest of the other chemical compounds, they were completely non-existent and in the roots, which means that the detection was negative.

The results obtained in our experience are identical to the results of **(Boizot et Charpentier., 2006)**, who said that flavonoids, glycosides, coumarins, and saponins are products of the secondary metabolism of plants and are present in all parts of higher plants: roots, stems, leaves, flowers, and fruits.This what we found at the aloe vera.Phytochemical analysis in our experiment in ***Aloe vera*** showed the presence of saponins, glycosides, tannins, and flavonoids, which are identical to the results of **(Igbinosa *et al*., 2009**). The presence of these active compounds in extracts made the plant known for its medical use, especially as an antimicrobial, in addition to the presence of soap, which has a strong effect against inflammation. Also, in this study the presence of saponins , terpenoids, flavonoids, tannins and glycosides in *Aloe vera* confirms a lot ofprevious studies. Among these studies, we can mention the studies of **(Thomas, 2012)** that showed the presence of saponins, terpenoids,flavonoids, tannins

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We have also tannins which has biological and pharmacological activity including antioxidants, antibacterial, antiviral, anti-heart, anti-tumor, anti-inflammatory and anti-immune **(Kumari and Jane, 2012).** As for flavonoids, they show many pharmacological activities such as antioxidants, antiallergies, anti-inflammatory, antimicrobial and anti-cancer **(Khanam *et al.*, 2015).**

Conclusion

Medicinal plants were and are used to treat illnesses and pains, and at the same time, it is also considered a raw material in modern medicine. There are an estimated **13,000** species of medicinal plants that have been used for at least a century as traditional remedies by various cultures around the world. Medicinal plants have been used by humans since ancient times and are the basis of herbal medicine. Their effectiveness is due to their compounds, which are very numerous and varied depending on the species and contain different active ingredients.

Urtica dioica and ***Aloe vera*** represent an important part of plant diversity, and morphological measurements and phytochemical screening are vital methods for studying their characteristics. Morphological measurements include studying the external appearance of different parts of the plant. For example, in our experiment, we recorded a slight difference in root length and number of leaves. We also noticed a clear difference between the ***Aloe vera*** plant and ***Urtica dioica***, especially in the length of the stems (**44cm** for ***Urtica dioica*** and **6cm** for ***Aloe vera***), fresh weight (**4,32 g** for ***Urtica dioica*** and **133,15 g** for ***Aloe vera***), and dry weight (**1,30g** for ***Urtica dioica*** and **91,46 g** for ***Aloe vera*)**.

Regarding the phytochemical screening in this study on ***Urtica dioica*** and ***Aloe vera***, which is based on examining the entire plant and studying both the vegetative and root parts, the results conducted on the nettleplant (***Urtica dioica***) showed that it is too rich in flavoinds and tannins, phenolic compounds, glycosides, saponins, especially in the vegetative part. As for the root part of***Urtica dioica***, we noticed a complete absence of terpenoids, quinones and anthraquinone. As for the ***Aloe vera*** plant, from the results obtained, we notice that it is very rich in most of the active substances, especially in the aerial or vegetative part, such as saponins and glycosides, coumarins, quinones, flavonoids. And the complete absence of tannins and phenolic compounds in the vegetative part and flavonoids and coumarins in the root part.

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Appendices

Appendices

Appendices 01

Chemical products

N°	Chemical products	Chemical formula
1	Ferric chloride	FeCl3
2	Sodium hydroxide	NaOH
3	Ammonium hydroxide	NH4OH
4	Sulfiric acid	H2SO4
5	Chloroform	CHCl3
6	Sodium chloride	NaCl

Appendices 02

Glassware and plastic material

balance
Test tube
Burette
spatula
Graduated cylinder
Beaker
Watch class
Test-tube rack
Pestle and mortar

Appendices 03

Equipment

 **Balance**	 **oven**
 **Water bath**	 **Vortex**

Appendices 04

Morphological measurements

plants	RL (Rootlength)
Urtica dioica	10 cm
Aloevera	9.25 cm

plants	SL (Stem length)
Urtica dioica	44 cm
Aloe vera	6 cm

Appendices

plants	CL (Composite leaves)
Urtica dioica	10
Aloe vera	11

plants	FW(Fresh weight)
Urtica dioica	4.32 g
Aloe vera	133.15 g

plants	DW(Dry weight)
Urtica dioica	1.30 g
Aloe vera	91.46 g

Academic year: 2023/2024 **Presented by:**
Zemieche Abdennacer

Theme:
Studies on phytochemical constituents of medicinal plants: Urtica dioica and Aloe vera

End-of-Study Project prepared for obtaining the master's degree

Abstract

Our study is carried out in the research laboratory at the Abdelhafid Boussouf Mila University Center. This work aims to conduct a morphological study of both ***Urtica dioica*** and ***Aloe vera*** plants in both the vegetative and root parts. The second study is a phytochemical study of each of the studied plants in order to find out the most important substances or compounds that play an effective role in the treatment process.

Recently, treatment with medicinal plants has spread in many countries of the world, the most important of which is Algeria. In this topic, we discussed two main types of these plants: ***Urtica dioica*** and ***Aloe vera***. The ***Urtica dioica*** is a herbaceous plant and has been used in various fields since prehistoric times and has great importance in medical treatment. As for the ***Aloe vera,*** it is a perennial plant that has also been known since ancient times and has many medicinal virtues and is considered one of the common plants in the field of cosmetics. Through the results obtained, it was concluded that the morphological differences between the two studied species play a major role in the differences in the amount of phytochemical compounds, whether the differences are between the shoot or root part, or the difference between the two studied species.

Keywords: *Urtica dioica*; *Aloe Vera*; Secondary metabolisme; Phytochemical screening; Aqueous extract.

In front of the jury:

President: Bouchair Khadidja……..M.A.B…....... Centre.Univ.A.Boussouf- Mila
Examiner: Amira Aicha……………..M.A.B........ Centre.Univ.A.Boussouf - Mila
Supervisor: Bouassaba Karima……..M.C.A......... Centre.Univ.A.Boussouf - Mila