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HISTOLOGICAL STUDY OF THE ROOT AND LEAF OF *WITHANIA FRUTESCENS* (SOLANACEAE) IN THE REGION OF TLEMCEN (WESTERN ALGERIA)

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ABSTRACT

Histology (from the ancient Greek hystos = tissue and logos = study) is the branch of biology and medicine that studies biological tissue. We used to talk about microscopic anatomies. It aims to explore the structure of living organisms, the constitutive and functional relationships between their functional elements, as well as tissue renewal. The methodology of plant histology is not fundamentally different from that of animal histology. The basic technique generally involves fixing the samples followed by hardening or inclusion in paraffin or plastics, sections by microtomy and then either topographic staining when looking for an overview, or specific when looking for an overview, or specific when wants to electively characterize certain structures. In this summary, we will present a study of the internal structure of the stem and leaf of *Withania frutescens* (Solanaceae) at the microscopic scale. The histological study carried out at the root and leaf level of *Withania frutescens* (Solanaceae) allows us to analyze the different structures well and with precision and to draw the general characteristics concerning the arrangement of tissues in plant organs.

Keywords: Histology, biology, *Withania frutescens,* Solanaceae

INTRODUCTION

Plant organisms, and particularly flowering plants, are distinguished from most animal organisms by remarkable characters. These plants are practically immobile and fixed in the ground. As a result, they are dependent on the environment around them. Flowering plants have nevertheless conquered the entire terrestrial environment and this thanks to a few characteristics. Plant histology is the part of plant biology that studies the microscopic structure of plant tissue. This science provides a basic structure for the study of physiology (Leesson, C.R and Leesson, 1980). First, photosynthesis allows them to find directly in the atmosphere the source of carbon necessary for the synthesis of their organic molecules. Second, the acquisition of an upright habit, a water absorption system directly in the soil and various water loss control systems allows them to withstand temporary or seasonal conditions that are sometimes difficult.

The plant is made up of different tissues with specific roles.

- The meristems or tissues of cell divisions,
- Parenchyma or fundamental tissue,
- Upholstery fabrics,
- Support tissues,
- Conduction tissues,
- Secretory tissues.

The histometric study carried out on the roots and leaves of *Withania frutescens* will allow us to accurately measure all the tissues observed.

MATERIALS AND METHODS

Samples of *Withania frutescens* (Solanaceae) were collected in the region of Tlemcen with the aim of identifying the histological characters of this species. Microscopic sections from suitably selected samples were made. These sections were analyzed in order to recognize and identify the structure of the different tissues. A large number of methods have been developed which allow knowing the plant tissues. Among the authors who have contributed to it, we cite (Deysson, G.1975); (Camefort, H.1977); (Roland, J.L and Roland, F., 1977); (Leesson, C.R and Leesson, T.S., 1981); (Harch, M.,1988), (Meyer, S., Reeb, C. and Bosdeveix, R.,2004).

This histological study required the following material:

• To obtain the cuts

Watch glasses
Razor blades
Object holder blade clamp
Blades covers objects
Strainer
Microscope

• For the coloring of the sections

Bleach

Distilled water

10% acetic acid

Methylene blue

Alum Carmine

A series of cross sections made with a razor blade, in the absence of a microtome, at the root and leaf level of *Withania frutescens* provide an overview of theorgan structure, position and respective importance of tissues; they are then placed in watch glasses containing distilled water. The finest are then selected for coloring. The technique of double staining with Carmine - Methylene Blue was then used, which consists of:

• Make very fine cuts

• put them in distilled water

• put them in bleach for 10 to 20 minutes

• rinse 3 times

• put them in Acetic Acid 5 to 10 minutes

• Do not rinse

• Apply Carmin Aluné 10 to 15 Min or Carmine red

• Rinse

• Put them in Iodine Green 30 Seconds

• Then wash the sections thoroughly.

We chose the thinnest sections, and we went to microscopic observation. Observation with an optical microscope allowed us to select the best sections either to take measurements using a micrometer at magnification (10x40) or to take pictures and take the best sections.

RESULT AND DISCUSSION

The observation of sections of the root of *Withania frutescens* made at the level of the Laboratory (Bouayed, I.S, 2018), shows the presence of numerous cellular tissues (from the inside to the outside):

• The medullary parenchyma

• The Xylem

• The phloem

• The cortical parenchyma

• The epidermis

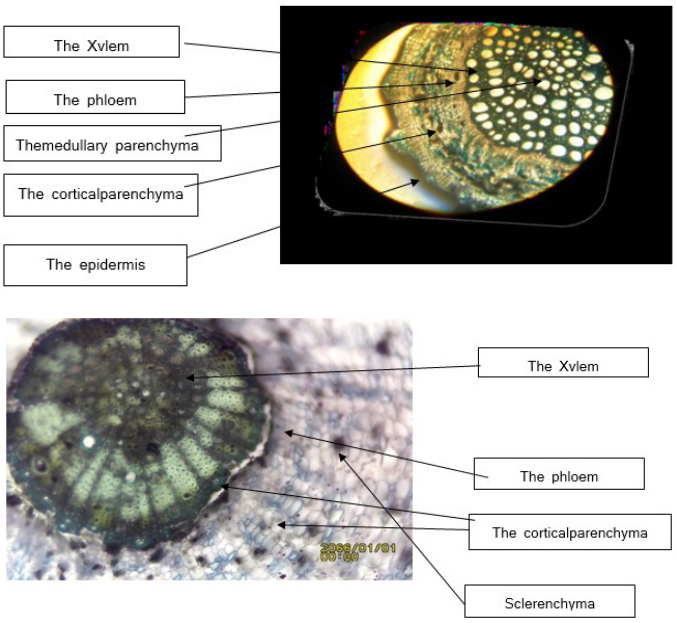

Figure -1: Cross sections of part of the root (BOUAYED, 2017)

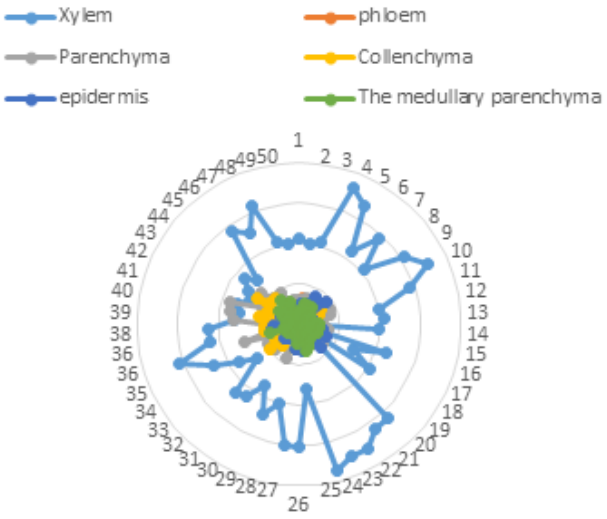

Figure - 2: Representation of the different types of tissue at the root level

The figure above represents the thickness (different in thickness) of each tissue, namely the phloem, xylem, epidermis, cortical and medullary parenchyma. It emerges from the figure above that: The xylem, which dominates by a very large thickness and crushes the other tissues, followed by the cortical parenchyma then the phloem, the collenchyma and finally the epidermis.

Observation of cross-sections under an optical microscope of the leaf allowed us to highlight and observe the following tissues:

1. The xylem;
2. The Phloem
3. The reserve parenchyma;
4. The chlorophyllous palisade parenchyma;
5. Theepidermis, which covers and protects the various tissues that come underne

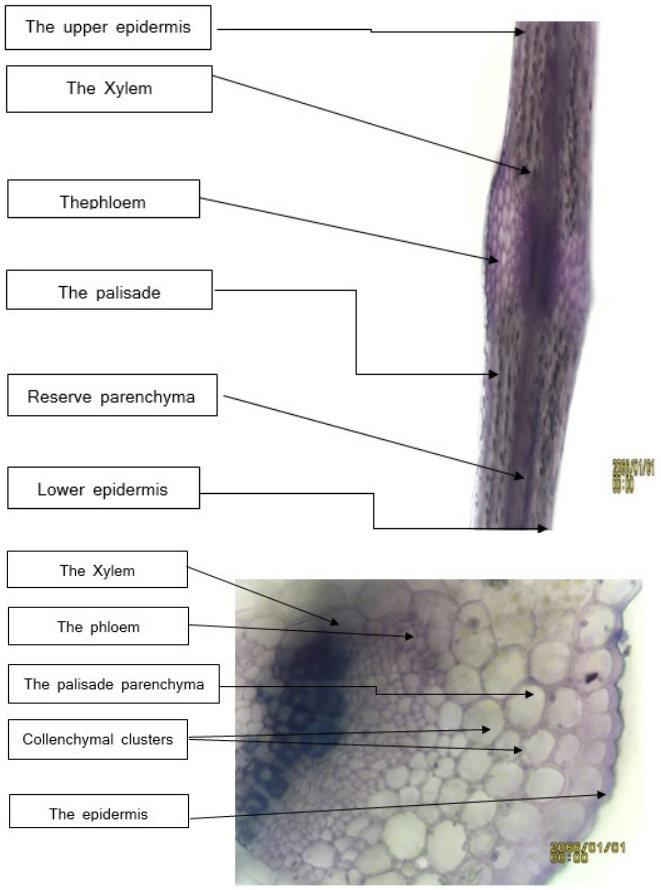

Figure - 3: Histological sections of the libero – ligneous bundles of the leaf of Withania frutescens (BOUAYED, 2017)

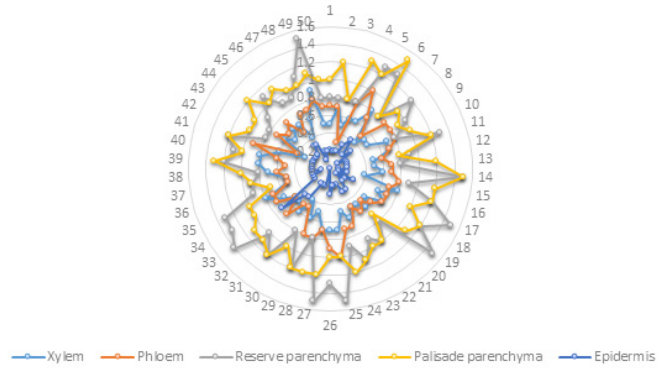

Figure - 4: Representation of the different types of cells at the leaf level

The figure above represents the thickness of each tissue namely xylem, phloem, palisade parenchyma, reserve parenchyma and epidermis.

Figure 4 also shows that the reserve parenchyma and the palisade parenchyma occupy almost almost all of the space by their thickness, which is substantial; crushing the other tissues, then follows an alternation between the Xilth and the phloem and in last position the epidermis. According to a study made by (Kebbas, Y.,2016), there is a highly significant correlation between tissues, especially at the level of epidermal cells forming a compact whole, which provides plant organs with effective mechanical protection against evapotranspiration.

According to (Benkou,2012), the xylem and the phloem occupy an important space within the leaf, and it is an adaptation of the species, which allows it to keep a sufficient level of hydration to allow the plant to carry out the osmosis operations necessary for its survival.

CONCLUSION

This study allowed us to know a certain number of characteristics, which served to specify the behavior of this plant in its living environment and its ability to resist and adapt to its environment. Finally, this species is found mainly in the Littoral, the Traras Mountains and the Tlemcen Mountains.

The histological study of the root and the leaf of the species *Withania frutescens* has enabled us to highlight, using numerous sections of the two organs (root, leaf), and certain histological adaptations of *Withania frutescens* particularly:

• A difference in the thickness of tissue from one organ to another.

• A more developed chlorophyll palisade parenchyma at the level of the leaves; this can be justified by the quasi substitution of the leaf in its assimilating role.

• A xylem and a phloem occupying an important space within the root and less important at the level of the leaf, and it is an adaptation of the species which allows it to keep a sufficient rate of hydration in the plant to achieve its osmosis operations necessary for its survival.

Indeed, the development of the xylem and the phloem in *Withania frutescens* makes it possible to offer the plant additional resistance to environmental constraints in a highly anthropized environment.

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