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Original Article

ANATOMICAL-HISTOLOGICAL STUDY OF SOME PLANTS USED IN THE TREATMENT OF BILHARZIA IN COTE D'IVOIRE

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ABSTRACT

Objective: The study of 11 plants used in the treatment of Bilharzia in Côte d'Ivoire aims to highlight their anatomical-histological structures.

Methods: The anatomical study of these plants was carried out on the stems by the classical method of staining the tissues with carmine-green.

Results: This staining technique made it possible to distinguish two groups of tissues. Those with a pink stained cell wall (cellulose wall cells) and those with a green stained lignified cell wall. From the periphery to the interior of the organs, we observe the epidermal hairs, the epidermis, the collenchyma, the cortical parenchyma, the sclerenchyma (for aged or more or less aged tissues), the liber or phloem, the wood or xylem and the medullary parenchyma.

Conclusion: The carmine-green staining made it possible to distinguish different plant stem tissues, arranged according to the colouring, structure, shape and size of the cells in each tissue.

Keywords: Medicinal plants, Anatomo-histology, Bilharzia, Ivory coast

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INTRODUCTION

Bilharzia has major health and socio-economic repercussions in developing countries, where it constitutes a major public health problem [1] and causes a brake in the achievement of the Sustainable Development Goals, particularly that of "enable everyone to live in good health and promote the well-being of all at all ages".

In Côte d'Ivoire, the results of parasitological surveys have shown that urinary and intestinal Bilharzia remain endemic with high prevalences in unfavourable hygiene and sanitation conditions despite control efforts [2].

The treatment of this disease, in the absence of a vaccine, is essentially based on chemoprevention (CP), which consists of distributing on a large scale, at regular intervals and to entire groups of the population, safe drugs of proven quality, alone or in combination [3] despite emerging drug resistance and low efficacy of PZQ have been reported in Egypt and Senegal [4].

To propose a biological therapeutic alternative, Bene *et al.* [5] 2023 conducted an ethnomedicinal study that selected 11 medicinal plants used in the management of bilharzia. In general, medicinal plants are used as raw materials for the extraction of biomolecules, precursors of synthetic chemicals [6] and for the manufacture of herbal medicines.

However, for the production of phytomedicines in large quantities, it is important to ensure the choice of the plant drug by observing anatomical sections of the organs used. In other words, the identity of the raw material used for drug development should be verified [6].

Thus, the present study was conducted with the objective of highlighting the anatomical-histological structures characteristic of these 11 plants used in the management of bilharzia.

MATERIALS AND METHODS

Table I shows the 11 selected plants and le part used. These plant species were identified during studies conducted by Bene *et al.* [2]. The organs were collected in the health district of Adzopé with the geographical coordinates 6°15'0" N and 3°49'60" W. A young stem of each plant was harvested to make the anatomical sections.

Table 1: Selected plants

Medicinal plants	Botanical families	Part used
Anthocleista djalonensis	Gentianaceae	Young stem
Blighia unijugata	Sapindaceae	
Cananga odorata	Annonaceae	
Cymbopogon giganteus	Poaceae	
Distemonanthus benthamianus	Fabaceae	
Eclipta prostrata	Asteraceae	
Eleusine indica	Poaceae	
Gouania longipetala	Rhamnaceae	
Mareya micrantha	Euphorbiaceae	
Scoparia dulcis	Plantaginaceae	
Vernonia amygdalina	Asteraceae	

Methods of the anatomical-histological study

The young and old stems of the plants were harvested and preserved in 30% alcohol. The 1 cm long organ was inserted into sorghum pith or polystyrene. Thin cross-sections were made with a new razor blade. All the sections obtained were soaked in diluted bleach or sodium hypochlorite for 20 min followed by a rinse with ordinary water. The sections were then soaked in acetic water for 15 min to neutralise the excess bleach, which is chemically basic and makes the cell walls receptive to the dye. After this step, the sections obtained were stained with carmino-green (a mixture of carmine alumina and iodine green) and then rinsed one last time with water. Thus, the cell walls were stained according to their chemical nature (cellulosic walls in pink and lignified walls in green). The stained sections were then mounted between slides in a drop of glycerine water [7]. The sections were focused at 40x magnification with a light microscope and observed at 100x magnification. After observation, the different sections were photographed using a mobile phone.

RESULTS AND DISCUSSION

Fig. 1 to 11 show the results of light microscopy of histological sections of the 11 selected plants. This observation of the sections makes it possible to distinguish the colour, structure, size and shape of the cells for each plant species. Two colours were observed: pink, characteristic of tissues with cellulose walls, and green for tissues with lignified walls. As for the structure, we observe tissues grouped in clusters, tissues arranged in rows and according to a size gradient. The cells of the tissues observed are of variable shape (elongated, rounded, polygonal, etc.). The cells can be small, medium or large. Generally speaking, from the periphery of the organ towards the interior, we observe epidermal hair, epidermis, collenchyma, cortical parenchyma, sclerenchyma (for more or less aged or aged tissues), primary liber or phloem, primary wood or xylem and medullary parenchyma. Two zones are thus distilled: the bark and the central cylinder. The latter is more developed than the bark [8, 9]. The bark extends from the epidermis to the sclerenchyma and the central cylinder consists of a basic parenchyma in which primary tissues (wood, liber, medullary parenchyma) and two secondary tissues (secondary wood and liber) resulting from the functioning of the cambium are distinguished. The differentiation of the primary wood cells is centrifugal. The wood and the liber are superimposed, which justifies the fact that the organs observed are stems. The secondary wood and the secondary liber are remarkable for their arrangement in radial rows [10-12]. These microscopic elements were observed on the cross sections of *Leucas aspera* [13, 14].

The cross-section of the stem of *Anthocleista djalonensis* where the medullary parenchyma is more developed shows the capacity of the plant to store metabolic reserves. The absence of epidermal hairs and the very thin cuticle confirm that this species is from forest areas [7]. The cross section of the stem of *Blighia uinjugata* shows a well-marked sclerenchyma and the alternation of the criblo-vascular bundles proves that it is an old dicotyledon. The section shows a well-established cambium and a developing sclerenchyma in most species and the strong green colouration of the walls of some indicates the presence of lignin. The presence of parenchyma in *Distemonanthus benthamianus*, *Mareya micrantha* and *Blighia unijugata* indicates that they are old stems; in these species only *Mareya micrantha* has an outline of branching. Furthermore, the criblo-vascular bundles with their high number are organised in a circle. This organisation of anatomical structure is a characteristic of dicotyledons. This result is similar to that of N'Guessan [7]. *Vernonia amygdalina*, *Eclipta prostrata* and *Cananga odorata* all have more or less aged organs due to forming sclerenchyma caps. *Eleusine indica* and *Cymbopogon giganteus* with a high number of criblo-vascular bundles show the ability of these plants to adapt to lack of water. It is worth noting the level of similarity observed in the cross-section of the stem of both species. The arrangement of the wood-liber bundle on several is characteristic of monocots. The location of the vascular bundle in the pith, the presence of the sclerenchyma ring and the arrangement of the tissues in the stem are all common features. Indeed, the presence of supernumerary bundles increases the plant's ability to absorb water [15]. *Scoparia dulcis* has a distinctive octagonal shape.

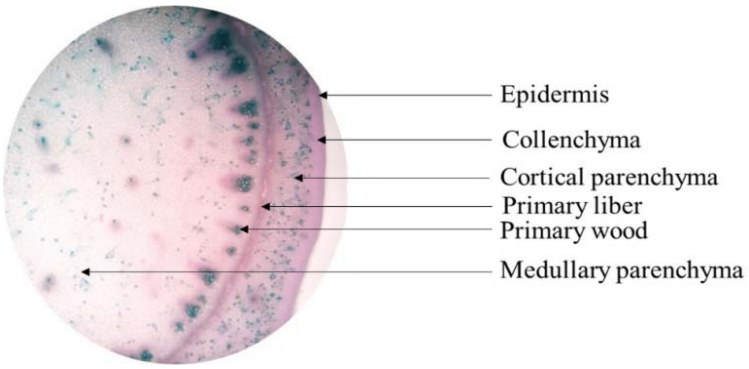

Fig. 1: Cross section of young stem of *Anthocleista djalonensis*

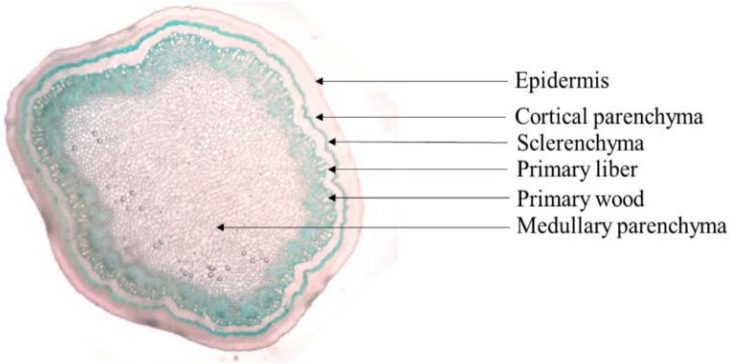

Fig. 2: Cross section of young stem of *Blighia unijugata*

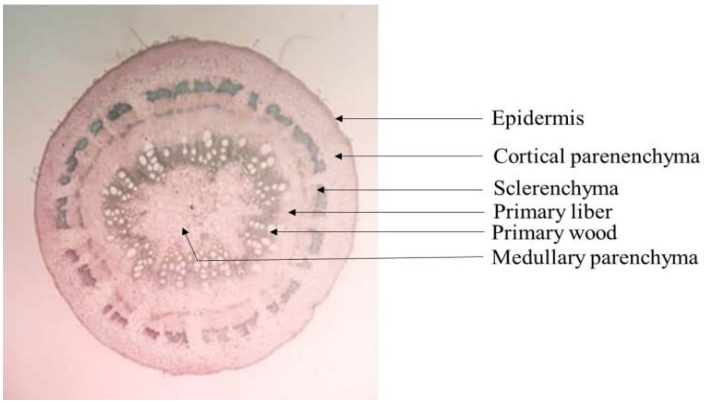

Fig. 3: Cross section of young stem of *Cananga odorata*

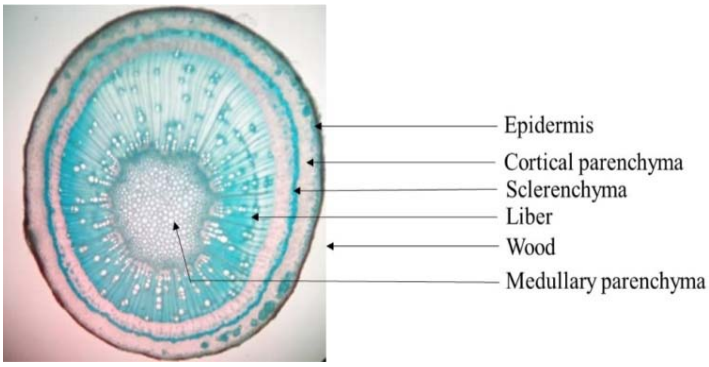

Fig. 4: Cross section of young stem of *Distemonanthus benthamianus*

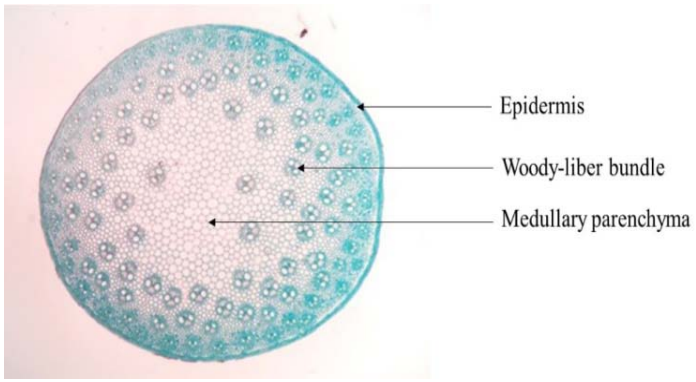

Fig. 5: Cross section of young stem of *Cymbopogon giganteus*

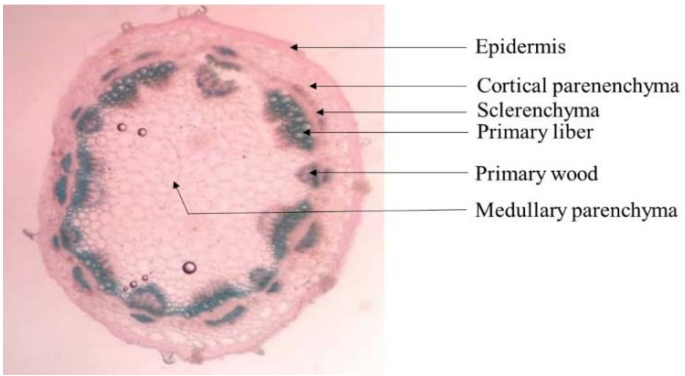

Fig. 6: Cross section of young stem of *Eclipta prostrate*

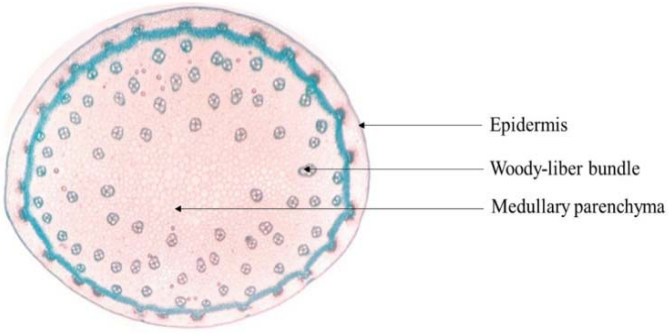

Fig. 7: Cross section of young stem of *Eleusine indica*

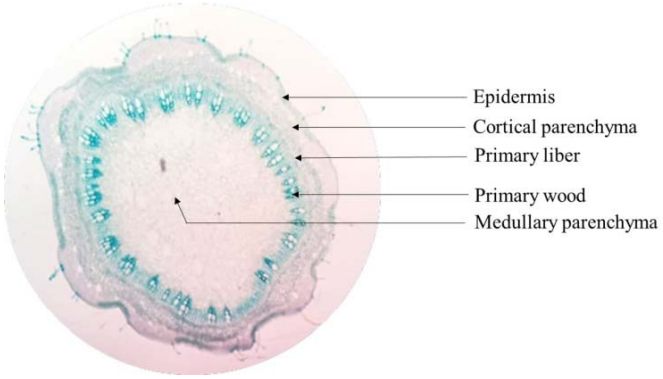

Fig. 8: Cross section of young stem of *Gouania longipetala*

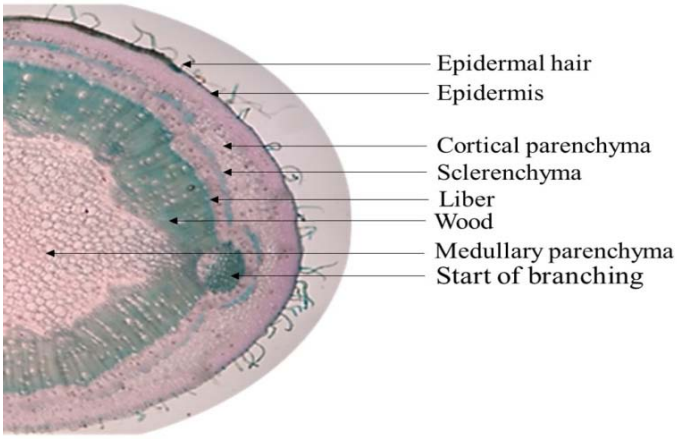

Fig. 9: Cross section of young stem of *Mareya micrantha*

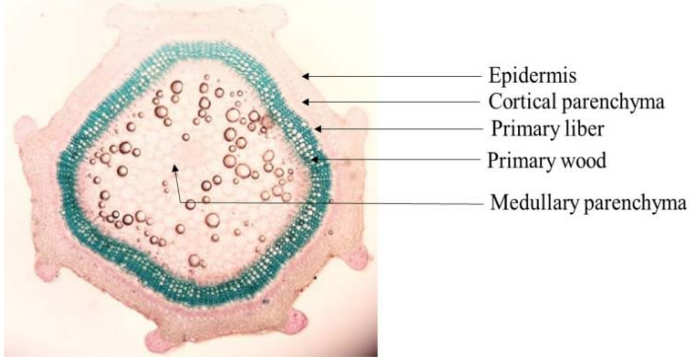

Fig. 10: Cross section of young stem of *Scoparia dulcis*

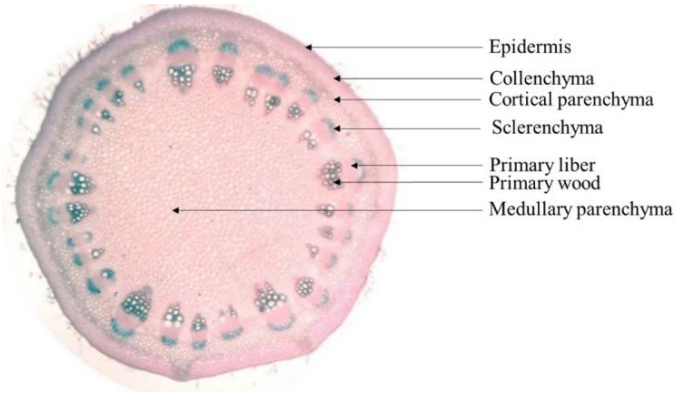

Fig. 11: Cross section of young stem of *Vernonia amygdalina*

CONCLUSION

The carmine-green staining made it possible to distinguish different plant stem tissues, arranged according to the colouring, structure, shape and size of the cells in each tissue. Thus, from the periphery to the interior of the organs, we observe the epidermal hairs, the epidermis, the collenchyma, the cortical parenchyma, the sclerenchyma (for aged or more or less aged tissues), the liber or phloem, the wood or xylem and the medullary parenchyma.

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AUTHORS CONTRIBUTIONS

All authors were involved in the study. KOUADIO BENE wrote the manuscript and all read and approved the final manuscript.

CONFLICTS OF INTERESTS

All authors have none to declare

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