ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 8, Issue, 2, pp. 15680-15684, February, 2017

International Journal of Recent Scientific Research

Research Article

STEM ANATOMICAL STRUCTURE OF THE PLANT *LUDWIGIA PERENNIS* L.

Sharmila, M*., Rajeswari, M., Geetha, DH and Indhiramuthu Jayashree

Department of Botany, Vellalar College for Women, Thindal, Erode, Tamil Nadu, India

ARTICLE INFO

Article History:

Received 06th November, 2015
Received in revised form 14th December, 2016
Accepted 23rd January, 2017
Published online 28th February, 2017

Key Words:

Ludwigia, stem, anatomy, epidermis, vascular, pith.

ABSTRACT

The present investigation is to provide information on the anatomical features of the stem of the plant *Ludwigia perennis*. The fresh stem was undertaken by rotary microtome and examined on photomicrographs, to find out identical characteristics. The stem consists of epidermis, crushed and obliterated cortical tissue, wide and hollow vascular cylinder, thin secondary phloem, thick secondary xylem, small and densely stained sieve elements, circular or angular thin walled vessels, narrow and square thick walled radial fibres, xylem rays, calcium oxalate druses, phloem elements and wide pith.

INTRODUCTION

Nature has provided a complete store-house of remedies to cure all ailments of mankind. The knowledge of drugs has accumulated over thousands of year as a result of man's inquisitive nature. So that today we possess many effective means of health care. In the past almost all the medicines used were from the plants being, man's only chemist for ages. Today a vast store of knowledge concerning therapeutic properties of different plants has accumulated. Powdered drugs of many plants are now available as plant products. (Iyengar, 1975; Iyengar and Yalc, 1975). Moreover, the adulteration of drugs is often found to be deliberate act, these days. Apart from the prevalence of such adulterations, it is also an accepted fact many of the well known formulations of indigenous system of medicine are viewed with great suspicion just because, properly identified crude do not seems to be used in their preparation (Dash and Bedi, 1967 and Yoga Narasimhan *et al*., 1974). Hence the need for evolving criteria for standard samples of crude drugs has become very important in pharmacogonosy. Proper scientific standards are also to be developed to check the uniformity of the products in a commercial management, as well as to have sort of control over the manufacture of spurious drugs, themselves (Israili and Issar 1975). Everywhere in the world research has been carried out to explore the hidden drugs and to utilize the healing property of herbs. The scientific validation of the herbs made the man to change his view towards the miraculous effect of plant products. Production of drugs without scientific quality control would be harmful to traditional systems of medicinal and to man's welfare.

Medicinal plants have important contributions in the health care system because there is no doubt that plant are a reservoir of potentially needful chemical compounds which serves as drugs. Plants have been containing a major source of medicaments, either in the pure active forms or as traditional preparations. The medicinal plants broadly growing in worldwide because of the increasing price, toxicity and allergic manifestations of the synthetic drugs (Krishnamurthi 2003; Evans 2002; Varier 1995 and Udayaprakash *et al*., 2012). It is confirmed that herbal preparation have long been used remedy for the treatment of infectious and other diseases in several countries (Sokmen *et al*., 1999).

Systematic anatomy has a long history since the invention of microscope. Taxonomists found anatomical similarities among related plant groups (Cutler *et al*., 2007). Anatomy along with plant structure and morphology always treated as the backbone of plant taxonomy and systematises elucidated the plant diversity, phylogeny and evolution following these traits (Endress *et al*., 2000). Anatomical data are applied to improve classification schemes and it is often used for identification. Wide range of anatomical data is used by systematises including anatomy from stem, leaf, petiole, stipule, node, flower, fruit, seed etc. Often these anatomical features are correlated with environmental factors. Anatomy of a plant is more conserve than morphological data therefore useful to circumscribe taxa with wide morphological variations.

*Corresponding author: **Sharmila, M***
Department of Botany, Vellalar College for Women, Thindal, Erode, Tamil Nadu, India

Anatomical structure of stem *Ludwigia perennis*

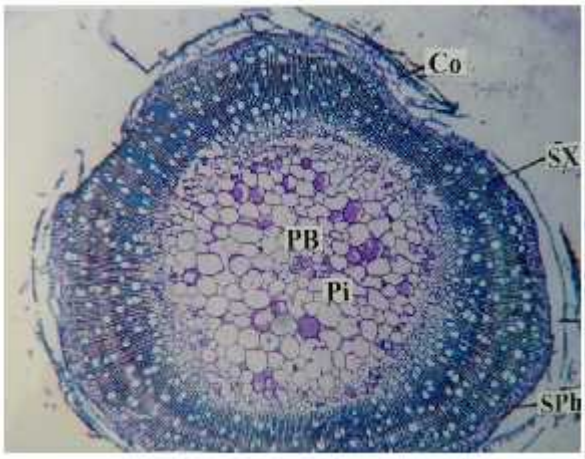

Fig: 1.1 T.S of stem - entire view CO – Cortex; PB – Pith Bundle; Pi – Pith; SPh – Secondary Phloem; SX – Secondary Xylem

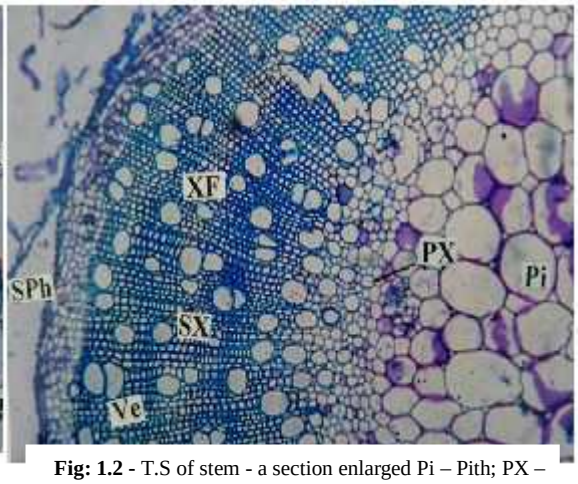

Fig: 1.2 - T.S of stem - a section enlarged Pi – Pith; PX – Primary Xylem; SPh – Secondary Phloem; SX – Secondary Xylem; Ve – Vessel XF – Xylem Fibres

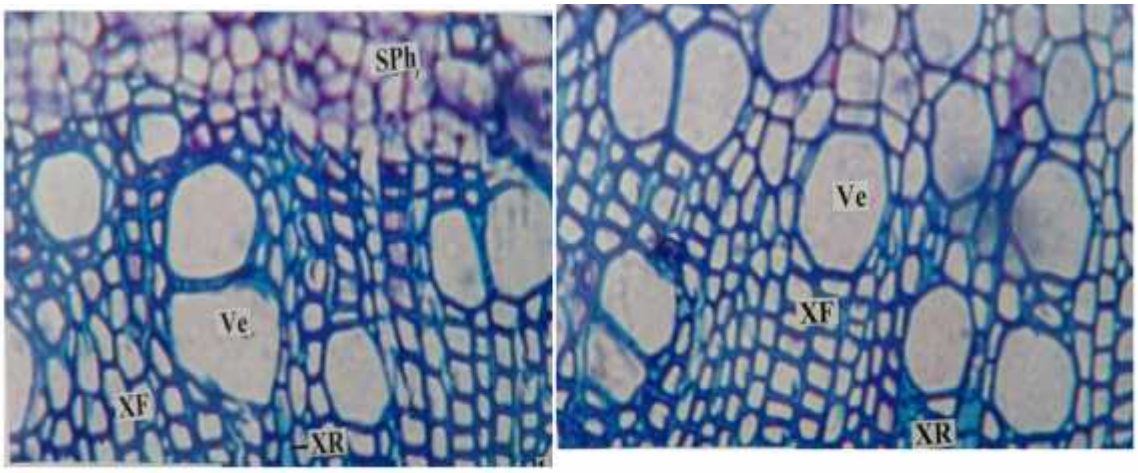

Fig: 2.1 and 2.2 - Secondary Xylem – Enlarged
SPh – Secondary Phloem; XF – Xylem Fibres; XR – Xylem Ray; Ve – Vessel

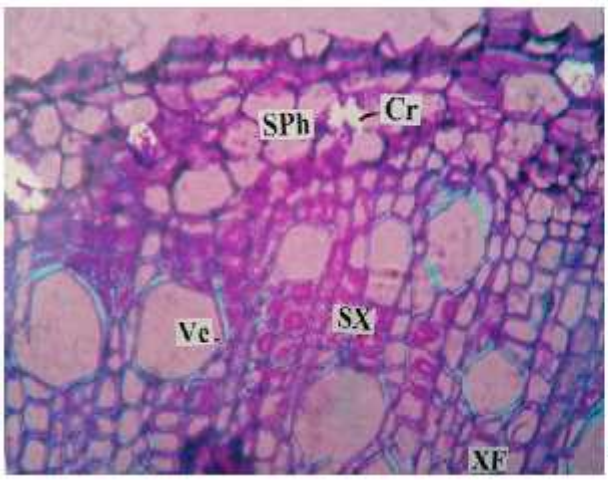

Fig: 2.3 - Crystals in the cortical cells Cr – Crystals; SPh – Secondary Phloem; SX – Secondary Xylem; Ve – Vessels; XF – Xylem Fibres

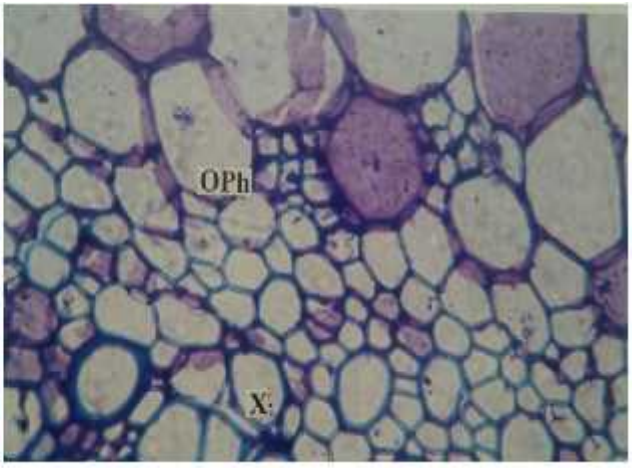

Fig: 3.1 Outer Phloem in the stem
OPh – Outer Phloem; X - Xylem

The role of anatomical data for traditional knowledge of folklore medicine is highly important since the earlier past. Use of micro morphology and anatomy is now a recognized tool in the field of plant systematic (Rahaman *et al*., 2008 and Choudhry *et al*., 2009). Therefore in this investigation, an attempt has been made to evaluate this medicinal plant for anatomical structure of stem *Ludwigia perennis* L.

MATERIALS AND METHODS

Collection of plant materials

The fresh plant *Ludwigia perennis* L. (Onagraceae) were collected in Erode district, India and were authenticated at Botanical Survey of India (BSI), Coimbatore, India.

Microscopic Analysis

Preparation of specimens

Care was taken to select healthy stem of *Ludwigia perennis* The fresh sample of stems were cut into small pieces and fixed in FAA solution (Formalin-5 ml + Glacial acetic acid-5 ml + 70 % Ethyl Alcohol-90 ml) as per the schedule given by Sass (1940). Infiltration of the specimens was carried by gradual addition of paraffin wax (melting point 58-60ºC) Tertiary Butyl Alcohol (TBA) until TBA solution attained super saturation. The specimens were cast into paraffin blocks.

Sectioning

The paraffin embedded specimens were sectioned with the help of Rotary Microtome. The thickness of the sections was 10-12 µm. De-waxing of the sections was done by customary procedure (Johansen, 1940). The sections were stained with Toluidine blue as per method published by O'Brian *et al*. (1964).

Staining

For anatomical studies the following staining schedules were followed by toluidine blue stain was prepared by dissolving 0.25gm of the stain in the mixture of benzoic acid 0.25gm, sodium benzoate 0.29gm and distilled water 200ml with $_{P}$H of 4.2 - 4.4. Since toluidine blue is a polychromatic stain, the staining results were remarkably good and some cytochemical reactions were also obtained. The dye rendered pink colour to the cellulose walls, blue to the lignified cells, dark green to suberin, violet to the mucilage, blue to the protein bodies etc. wherever, necessary sections were also stained with safranin and Fast-green and IKI (for starch). (IKI- lugol's iodine is a brown solution that turns black in the presence of starch). For studying stomata morphology, venation pattern and trichome distribution, paradermal sections (sections taken parallel to the surface of leaf) as well as clearing of the leaf with 5% sodium hydroxide or epidermal peeling by partial maceration employing Jeffrey's maceration fluid (Sass,1940) were employed. Glycerin mounted temporary preparations were made for macerated materials.

Photomicrographs

All permanent slides, after staining were dehydrated by using graded series of Ethanol + Xylol and mounted in DPX. Microscopic descriptions of tissues were supplemented with micrographs wherever necessary. Photographs of different magnifications were taken with Nikon lab photo-2microscopic using Konica colour film (100 ASA). For normal observations bright field was used. For the study of crystals, starch grains and lignified cells, polarized light was used since these structures have bi refringent property, appear bright against dark background. Magnifications of the figures are indicated by the scale-bars. Descriptive terms of the anatomical features were taken from the standard anatomy books (Esau, 1964).

RESULT

Anatomical structure of Ludwigia perennis – T.S of stem

The stem is circular. The epidermis and cortical tissues are crushed and obliterated. The vascular cylinder is wide, hollow and encloses with the wide pith (Fig: 1.1).

Vascular cylinder

Vascular cylinder consists of outer thin continuous layer of secondary phloem and inner thick, dense secondary xylem.

Secondary phloem

The secondary phloem consists of small, densely stained sieved elements and slightly larger phloem parenchyma cells.

Secondary xylem

Secondary xylem includes mostly solitary, circular or angular, thin walled vessels and narrow square, thick walled, compact radial fibres (Fig: 1.2, 2.1 and 2.2). The xylem rays are thin and straight. The vessels are 50µm wide. Calcium oxalate druses are sparsely seen in the phloem parenchyma (Fig: 2.3).

Phloem elements

Phloem elements are seen in both an outer part of the xylem cylinder (Fig: 3.1) and inner part of the xylem cylinder. The inner phloem is called medullary phloem (Fig: 3.2).

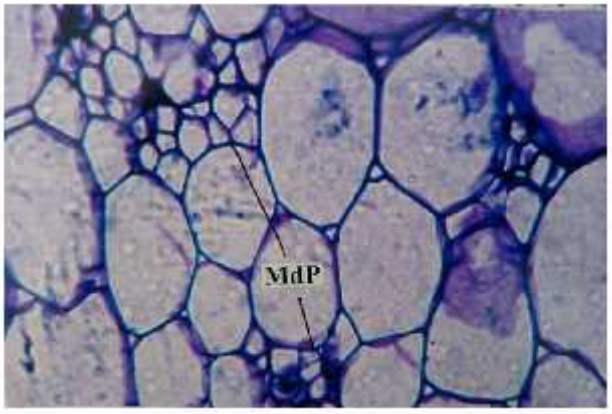

Fig: 3.2 Medullary Phloem

MdP – Medullary Phloem

DISCUSSION

Similarly Ahlam Salih and Bouran Ibrahim (2010) reported that, the anatomical structures of the leaves and stems of the two medicinal plants *Cymbopogon citratus* and *Cymbopogon schoenanthus* was carried out to outline the diagnostic characters; thus helping to identify them, to classify them using the anatomical characters and to distinguish between them to avoid adulteration. This study showed that the differences between the two species are as follows: the spongy parenchyma of *C. citratus* is formed of 1-2 cells thick following the upper

epidermis, in *C. schoenanthus* the upper epidermis is formed of small cells followed by patches of sclerenchyma cells only above the vein regions and the spongy parenchyma are formed of 3-5 layers of small cells. Kranz structure which is the vascular bundles are embedded in chlorenchyma cells, is found in the two species but it is well developed in *C. citratus* where the chlorenchyma are in circling the vascular bundles but in *C. schoenanthus*, the chlorenchyma are found only on lateral sides of the vascular bundles. In *C. citratus*, the lower epidermal cells just below the vascular bundles are projecting forming papillae; *in C. schoenonthus* the papillae are small. In the epidermal cells of the leaf of *C. citratus* there are tannin depositions they give positive results with $FeCl_3$ reagent they appear as large dark cells. Small quantities of oil were detected in the leaf epidermal cells and the mesophyll. The numbers of vascular bundles are more in the stem of *C. citratus* and the amount of sclerenchyma cells surrounding them are more. The number of xylem vessels in a vascular bundle is 3-4 xylem vessels. The anatomical structure of *Cordia obliqua* showed (Uthiraselvam, 2016) that there is concentration of vascular bundles at the central portion of root cortex, calcium oxalate presence in the root powder and non glandular trichome were present in the leaves.

Muazaz Azeez *et al*., (2016) identified that the anatomical features of Cordia myxa stem, leaf and petiole in Iraq. Peeling method have been clarified anomocytic stomata with anticlinal walls of epidermal cells, the cross sections of lamina shown the unicellular epidermis in abaxial and adaxial surface, unicellular trichomes spread in the epidermis. adaxial covered by thick cuticle, bifacial mesophyll. idioblasts spread through palisade parenchyma, oval to circular shape cells of spongy parenchyma, midrib have large concentric vascular bundle is present at the midrib region and one vascular bundle in above. Petiole shape is square with five vascular bundle appear, the big one located on the central and four vascular bundle located in the corners. The dried leaf powder was brown to green in color, microscopy of the powder showed fragments of unicellular trichomes, stomata, fibers, crystal differ in shape like as regular prismatic, druses, sand crystal, and dendritic crystal like as snowflake formation in shape.

Janarthanan *et al*., (2016) realised that pharmacognostic profile of whole plant of *Ageratum conyzoides* Linn. (Asteraceae), known as appa grass and an important medicinal plant in the traditional medicinal system of India. Methods: Whole plants of *Ageratum conyzoides* Linn. were studied by macroscopic, pharmacognostic anatomy, powder analysis, quantitative microscopy, histo-chemical characters and physico-chemical standards and other methods for standardization were performed by WHO and pharmacopeia recommended methods. Macroscopically, the leaves are stalked ovate, sub acute, crenate with ciliate margins and 4-10cm long and 1-5cm wide, the stem are pink or greenish yellow covered with fine white hairs and flowers are purple to white, arranged in close terminal inflorescences. Fruits (achene) are easily dispersed. Roots are yellowish brown and root base nodes and internodes. Transverse section of leaf showed the presence of spongy mesophyll, vascular bundles, multicellular glandular trichomes and diacytic stomata, pericyclic fibres and calcium oxalate crystals in stem, Phelloderm and granular secretion staining pink with iodine in the Pholem parenchyma are some of the diagnostic features noted from anatomical study. Powder microscopy of whole plant revealed the presence of parenchyma with oil cells, glandular trichome, fibres and diacytic stomata. The investigations also included leaf surface data, quantitative leaf microscopy and physico chemical parameters such as ash values, extractive values, crude fibre content and loss on drying. The results of the study can serve as a valuable source of information and provide suitable standards for identification of *A. conyzoides* in future investigations and applications.

CONCLUSION

Plant anatomy has been found to be very essential in plant taxonomy. Hence, the purpose is to develop a system of classifying plants in a way that all the differences and similarities are set out in ordered manner at a glance. Therefore, the stem sectional anatomy provides extensive taxonomic data. Thus, from the stem anatomical characters are observed in the plant *Ludwigia perennis* L.

Acknowledgement

Authors thank to Professor P. Jayaraman, Director, Institute of Herbal Botany Plant Anatomy Research Centre, Chennai for help in leaf anatomical studies.

References

Ahlam Salih, E. and Bouran Ibrahim, A. (2010): Leaf and stem anatomy of Cymbopogon citratus and Cymbopogon schoenanthus in Sudan, *Journal of Chemical and Pharmaceutical Research*. 2(4): 766-771.

Choudhury, S., Rahaman, C.H. and Mandal, S. (2009): Studies on foliar epidermal micromorphology and preliminary phytochemical screening of three medicinally important taxa of the family Vitaceae. *Sci. & Cult.* 75 (7-8): 294-300.

Cutler, D.F., Botha, C.E. and Stevenson, D.W. (2007): Plant Anatomy: An Applied Approach, (Blackwell Publishing Ltd., Oxford, U.K.).

Dash, B. and Bedi, R. (1967): Indigenous drugs for import substitution, Indian std. Inst. Bull. 19: 393-396.

Endress, P.K., Baas, P. and Gregory, M. (2000): Systematic plant morphology and anatomy-50 years of progress. Taxon. 49: 401-434.

Esau, K. (1964): Plant Anatomy. *John Wiley and sons, New York*, 767.

Evans WC Trease and Evans' Pharmacognosy, WB. (2002): Souders Company Singapore. 1.

Israili, A.H. and Issar, R.W. (1975): Adulterated drug and their standardization, *Jour, Res. Ind. Med*. 10: 55-60.

Iyenga, and Yalc, S.G.K. (1975): Anatomy of crude drugs, Ied. Manipal power press: Manipal India.

Iyengar, M.A. (1974 & 1975): Anatomy of crude drugs, Ied. Manipal power press: Manipal India.

Janarthanan, L., Karthikeyan, V., Jaykar, B., Balakrishnan, B.R., Senthilkumar, K.L. and Anandharaj, G. (2016): Pharmacognostic Studies on The Whole Plants of Ageratum conyzoides Linn. (Asteraceae), *European Journal of Pharmaceutical and Medical Research*. 3(5): 618-626.

Johansen, D.A. (1940): Plant Microtechnique. Mc Graw Hill Book Co; New York. 523.

Krishnamurthi, A. (2003): The wealth of India. Vol. I, CSIR, New Delhi. 92.

Muazaz Azeez, A.H., Aseel Kadhim, A.A. and Mazin Nwaf, A.A. (2016): Anatomical Study of Vegetative Parts and Powder Microscopy of Cordia Myxa L. (Boraginaceae) In Iraq, Int'l. *Journal of Advances in Chemical Engg., & Biological Sciences* (IJACEBS). 3(2): 232-235.

O'Brien, T.P., Feder, N. and Mc Cull, M.E. (1964): Polychromatic Staining of Plant Cell walls by toluidine blue-O. Protoplasma. 59: 364-373.

Rahaman, C.H., Choudhury, S. and Mandal, S. (2008): Studies on foliar Epidermal micromorphology and stem xylem elements of Dipteracanthus prostratus and Hygrophila schulli - two medicinl plants of Acanthaceae. *J. Botan. Soc. Beng.* 62 (1): 33-42.

Sass, J.E. (1940): Elements of Botanical Microtechnique. Mc Graw Hill Book Co., New York. 222-232.

Sokmen, A., Jones, B.M. and Erturk, M. (1999): The in vitro antibacterial activity of Turkish medicinal plants. *J. Ethnopharmacol*. 67: 79–86.

Udayaprakash, N.K., Bhuvaneswari, S., Jahnavi, B., Abhinaya, K., Rajalin, A.G., et al. (2012): A study on antibacterial activity of common weeds in Northern Districts of Tamil Nadu, India. Res. *J. Med. Plant*. 6: 341-345.

Uthiraselvam, M., Asmathu Fathima, S., Ravikumar, S. and Saravana Gandhi, A. (2016): Anatomical and Histochemical Studies on Cordia Obliqua, World *Journal of Pharmacy and Pharmaceutical Sciences*. 5(8): 1332-1341.

Varier, P.S. (1995): Indian Medicinal Plants, Vol. IV, Orient Longman Pvt. Ltd., Hyderabad. 149.

Yoga Narasimhan, S.N., Venkataram, B.S. and Togunashi, V.S. (1974): Standard specimen- its needs and advantages for Ayurvedic Drugs, *Jour, Res. Indian Med.* 9: 111-114.

****

How to cite this article:

Sharmila, M *et al*.2017, Stem Anatomical Structure of The Plant Ludwigia Perennis L. *Int J Recent Sci Res.* 8(2), pp. 15680-15684.