

Nodal Anatomy in *Woodfordia fruticosa*, *Cuphea ignea* and *Lawsonia inermis* L. (Lythraceae)

Anil A. Kshirsagar

UG & PG Department of Botany, Shivaji Arts, Commerce & Science College Kannad, Dist. Aurangabad (MS) -
431103

ABSTRACT

The vascular organization of the node in three plant species like *Woodfordia fruticosa*, *Cuphea ignea* and *Lawsonia inermis* has been investigated. The leaves are generally opposite and slightly alternate in *Lawsonia inermis*. The foliar nodes are unilacunar one traced noted in all studied taxa. The node has sclerenchymatous patches outside except in *Cuphea ignea*. The variation in nodal vasculature can be used for the delineation of taxa. The present paper deals with the study of nodal vasculature in plants belonging to family Lythraceae.

Keywords: Node, Vasculature, *Woodfordia*, *Cuphea* and *Lawsonia* (Lythraceae)

INTRODUCTION

The study of nodal organization and vasculature is widely employed in the systematic and phylogenetic studies earlier Sinnott^[10] recorded unilacunar one traced node in scrophulariaceae. Studies of Ozenda,^[8] Dickson,^[4] Takhtajan,^[14] reveals that the tri-multilacunar type with double trace at the median gap as the primitive nodal type from this other types has been derived. Cronquist,^[2] has also indicates unilacunar node with single trace. There are few families with unilacunar nodes which show variation in the vasculature. The present study deals with the details of nodal structures in three species of genus *Woodfordia*, *Cuphea* and *Lawsonia* belonging to family Lythraceae.

MATERIALS AND METHODS

The plant material of three plant species like *Woodfordia fruticosa*, *Cuphea ignea* and *Lawsonia inermis* are collected from Kannad and Botanical garden of Dr. Babasaheb Ambedkar Marathwada University Aurangabad. They were fixed in FAA and are preserved in 70% alcohol. Free hand serial sections were taken and slides prepared by following usual methods of dehydration, clearing and embedding in paraffin wax. These sections were stained either in saffranin or light green combination.

Observations: The observations of nodal anatomy in three plants such as *Woodfordia*, *Cuphea* and *Lawsonia* belonging to family Lythraceae can be observed which is as follows.

1. *Woodfordia fruticosa*: The leaves arise at each node in an opposite manner. They are sessile. A prominent arc-shaped median trace is given out from each opposite leaves at a nodal region leaving behind a gap (Figs.1 e, f, g, and h) The node has patches of sclerenchymatous tissue outside the vasculature. The median trace extends into the leaf without splitting. The node is unilacunar one traced.

2. *Cuphea ignea*: In this plant the phyllotaxy is opposite at nodal region. At the nodal region an arc-shaped prominent vasculature trace is separated out leaving behind a gap (Figs. 2a, b, c, and d). Thus making a node unilacunar single traced structure. The vascular trace is extends into the leaf (Fig.2d).

3. *Lawsonia inermis*: The leaves are opposite and slightly alternate. The vascular cylinder at the internodal and nodal region has many patches of sclerenchyma outside. It bears a broad arc-shaped median trace leaving behind a gap. The sclerenchymatous patches extend into the petiole along with median trace (Figs. 3e,f, g and h) The node is unilacunar one-traced.

DISCUSSION

The present study brings out some interesting features while exhibiting a greater degree of uniformity in the studied plants. The node shows only one major type of category that is unilacunar one traced structures. The unilacunar node with an arc shaped trace occurs in all studied plant species. It is interesting to note that the solitary arc shaped strand emerges out from the axial stele and while extending upwards and towards the petiole it invariably give off two lateral strands in case of *L.microcarpa*, *L.parviflora*, *L.reginae*, *L.speciosa*, and *L. tomentosa*.

Figures: Abbreviation used (Scl. - Sclerenchymatous.)

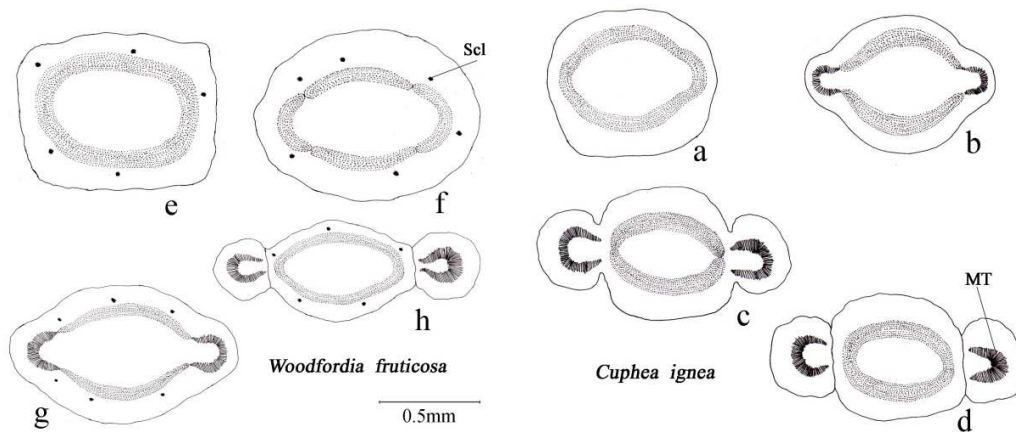


Figure 1: *Woodfordia fruticosa*

Figure 2: *Cuphea ignea*

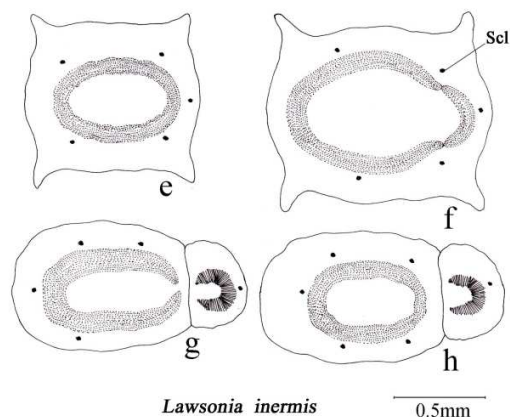


Figure 3: *Lawsonia inermis*

In *Woodfordia fruticosa* the node has patches of sclerenchymatous tissue outside the vasculature. The median trace extends into the leaf without splitting. The node is unilacunar one traced. In *Cuphea ignea* at the nodal region an arc-shaped prominent vasculature trace is separated out leaving behind a gap. Thus making a node unilacunar single traced structure. The vascular trace is extends into the leaf. In *Lawsonia inermis* a broad arc-shaped median trace

leaving behind a gap. The sclerenchymatous patches extend into the petiole along with median trace. The node is unilacunar one-traced. In some species of *Lagerstroemia* two or more additional bundles formed by the solitary arc strand extend as the cortical or accessory bundles in the petiole. The mechanical tissue in the form of sclerenchyma extends around the vasculature. It forms distinct patches in *L. indica*, *L. microcarpa*, *L. parviflora*, *L. reginae*, *L. speciosa*, and *L. tomentosa*. The occurrence and variation of sclerenchyma may be looked upon from the point of view of requirement of rigidity or mechanical strength. The increase in the size and number of patches of sclerenchyma in these plants appear to be related to the habit of the plants and size of the leaves Sinnott,^[10] in his survey on the nodal organization of flowering plants has advocated that, the Lythraceae possess a unilacunar single traced node. Cronquist,^[2] has also indicated unilacunar nodes with single trace. There are few families with unilacunar nodes which show variations. The nodal anatomy in Verbenaceae reveals that the unilacunar node with one, two or many traced conditions. Marsden and Bialek,^[7] Esau,^[5] Shah,^[11] Banger,^[1] while attempting the study on large number of taxa, Sinnott,^[10] emphasized the importance of the leaf trace and leaf gap in the systematic angiosperms. Sinnott,^[10] reported three basic types of nodes for angiosperms and out of these he considered that three traced condition is primitive and unilacunar, the multilacunar type derived from it by reduction or amplification of the original bundles and their gaps. Ozenda,^[8] on the basis of nodal anatomy of the Magnoliales considered the multilacunar node is primitive type the trilacunar and unilacunar derived from it by reduction. Dickson,^[4] on the basis of her studies on nodal pattern of Dilleniaceae contradicted the views of Ozenda,^[8] Takhtajan,^[14] postulated tri-multilacunar type with a double trace at the median gap as the primitive nodal type and from this other types has been derived. The present study reveals that all the studied taxa shows unilacunar single traced nodal vasculature. The nodal vasculature of *Lagerstroemia* species consist of unilacunar one traced observed by Kshirsagar. A,^[6]

On the basis of present study and that of other Sutar,^[12] Sutar and Vaikos,^[13] Banger,^[2] it may presume that, either the arc is result of fusion of several traces into one broad arc or it get amplified to give many branches. Canright,^[3] Philipson and Philipson,^[9] are of the opinion that the arc is derived as a result of ontogenetic and phylogenetic fusion of several traces. Visualizing the various suggestions it could be conceived that in the family Lythraceae too nodal evolution must have evolved a reduction process. Such a nodal characters are useful for the taxonomic delineation of species.

REFERENCES

- [1] Banger Meenakshi, A, Morphological studies in some Verbenaceae *Ph.D Thesis. Dr. Babasaheb Ambedkar. Marathwada. University, Aurangabad, 2002.*
- [2] Cronquist, A., An integrated system of classification of flowering plants, Columbia University Press, New York. **1981**
- [3] Canright J.E., *J. Arnold Arbor* **36**:119-140 **1955.**
- [4] Dickson, W.C., *J. Arnold Arbor. Harv. Univ.* **50**: 384-410. **1969**
- [5] Esau k., *Plant Anatomy* Jhan Willey and Sons, New York. **1965**
- [6] Kshirsagar A, *Asian journal of plant science and research*, **5(8)**: 47-50. **2015**
- [7] Marsden MPF and IW Bailey, *J. Arnold Harv. Univ.* **36**:1-50. **1955**
- [8] Ozenda, *Recherches Surv. Les Dicotyledonous apocarpiques. pub. Lab. I Ecole. Normal supesieure Ser. Bio. Fase-II, Paris.* **1949**
- [9] Philipson W.R. and Philipson M.N., *J. Arnold Arb. Harv. University.* **49**: 193-224. **1968**
- [10] Sinnott E.W., *Amer. Jou. Bot-I* **303-332.** **1914**
- [11] Shah J.J., Patel J.D. and Kothari I.L., Vascular supply of axillary buds in some dicotyledonous. *Adv. Plant Morpho. (Prof. Puri. Commemoration of ed. Y.S. Murty, B.N. Joshi, H.V. Mohan Ram and T.M. Varghese. Satish prakashan meerut, pp 65-75.* **1972**
- [12] Sutar, The morphological studies in some Tubiflorae: The scrophulariaceae *Ph.D. Thesis Dr. B.A. Marathwada University, Aurangabad.* **1997,**
- [13] Sutar and Vaikos, *J. Indian Bot. Soc.* **Vol. 77. 39-42,** **1998**
- [14] Takhtajan A.L, *Flowering plants: Origin and dispersal.* English Translation C. Jeffery, Oliver and Boyd. Edinburgh **1969.**