

## Study of Petiolar Anatomy of Some Medicinal Plants Mentioned in the Atharvaveda

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**Abstract:** Comparative anatomical studies of angiosperms have achieved a remarkable record as anatomical characters have been employed with great success to the solution of difficult taxonomic problems. The value of the characters is measured for its constancy. The more constant the character, the greater is the reliability that can be placed upon it. Hence in the present study five medicinal plants from Atharvaveda viz. *Acacia nilotica*, *Acacia suma*, *Aegle marmelos*, *Ficus bengalensis* and *Ficus religiosa* were selected for their petiolar anatomy. Because petiolar anatomy is one of the important anatomical biomarkers and this study would help in the identification and authentication of the selected medicinal plants on the basis of petiolar anatomy.

**Keywords:** Petiolar Anatomy, Atharvaveda, Anatomical Biomarkers, *Aegle marmelos*, *Acacia nilotica*, *Acacia suma*, *Ficus bengalensis*, *Ficus religiosa*

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### 1. INTRODUCTION

Comparative anatomical studies of angiosperms have achieved a remarkable record as anatomical characters have been employed with great success to the solution of difficult taxonomic problems. The value of the characters is measured for its constancy. The more constant the character, the greater is the reliability that can be placed upon it. The importance of micromorphological features (anatomical biomarkers) for the taxonomic consideration of angiosperms is now well established (Ramayya, 1972 [1], Tomlinson, 1979 [2]; Ogundipe and Akinrindale, 1998 [3] and Parveen et al., 2000 [4]). The first summary of the systematically more useful anatomical characters with an evaluation of their importance was provided by Fritsch (1903) [5]. Metcalfe and Chalk (1950 [6], 1967 [7] and 1983 [8]) have enumerated a large number of anatomical characters of diagnostic value for different families.

Hence, the aim of the present study is to use the characters of petiolar anatomy as aid in taxonomy of the selected medicinally useful plants from Atharvaveda. The study would help in the identification and authentication of the selected medicinal plants on the basis of petiolar anatomy.

### 2. MATERIALS AND METHODS

#### 2.1. Plant Materials

The medicinal plant specimens *Acacia nilotica* (L.) Willd ex Del. and *Acacia suma* (Roxb.) Buch. Ham. belonging to family Mimosaceae, *Aegle marmelos* (L.) Corr. belonging to family Rutaceae and *Ficus bengalensis* L. and *Ficus religiosa* L. belonging to family Moraceae were taken for petiole anatomy. The species identification of the selected material was determined according to standard literature.

#### 2.2. Anatomical Analysis

Sections through base, middle and apical portion (near lamina base) of petiole were taken for studying petiolar anatomy. Pieces of petiole were fixed in F.A.A. and processed for free hand sections. All the sections were stained in saffranin and dehydrated following the usual method of

Johansen (1940) [9] and mounted in Canada balsam. The details of petiole anatomical characters were studied under Labomed binocular research microscope. Some quantitative characters such as petiole length, cross-sectional area of petiole, and distance from vascular bundle to adaxial and abaxial surfaces, number of pith bundles and number of vascular bundles in wings were studied and analyzed for the patterns of variability.

**3. RESULT AND DISCUSSION**

Transectional outline through middle region is roundish- oval in all the selected taxa. Epidermis in all the taxa is typically 1- layered with difference in shape of the cells and outer and inner wall.

Distinguished hypodermis is present in all the taxa except *Acacia nilotica* and *Acacia suma*. It is continuous and collenchymatous in *Aegle marmelos*, *Ficus bengalensis* and *Ficus religiosa*.

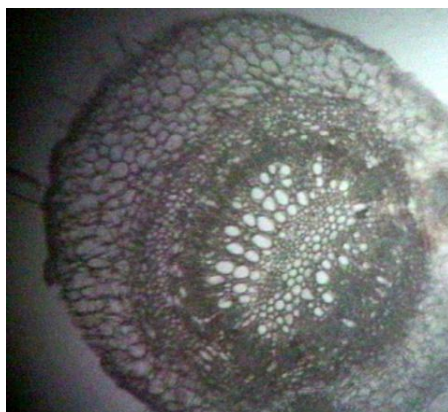
Regarding petiole anatomy, completely closed cylinder observed in *Acacia nilotica*, *Acacia suma*, *Aegle marmelos* and *Ficus religiosa* while *Ficus bengalensis* showed open, dissected arc. Medullary vascular bundles present only in *Aegle marmelos*. Perivascular sclerenchyma in complete closed cylinder is present in *Acacia nilotica*, *Acacia suma*, *Aegle marmelos* and *Ficus religiosa* and around circular vascular bundle in *Ficus bengalensis*. Likewise other qualitative and quantitative features have also been studied and mentioned in Table.1 and 2

**Table1. Qualitative Features of Petiole Anatomy**

Name of Taxa	Epidermal Cell			Hypodermal layers			Type of median vascular bundle	Perivascular Sclerenchyma	V.B. per wing	Medullary V.B.
	Shape	Walls		Adaxial	Abaxial	lateral				
		Outer	Inner							
<i>A.nilotica</i>	Roundish	Roundish	Roundish	Not distinguished			Complete, adaxially flat	Present in complete closed cylinder	Absent	Absent
<i>A.suma</i>	Roundish	Roundish	Roundish	Not distinguished			Complete Close Cylinder	Present in complete closed cylinder	Absent	Absent
<i>A.marmelos</i>	Roundish-squarish	Roundish	Roundish	3-4	4-5	2-3	Complete closed cylinder	Closed cylinder, discontinuous at few places	Absent	Present
<i>F. bengalensis</i>	Squarish	Roundish	Roundish	6-7	8-9	5-6	Open, collateral V.B. with dissected arc	Present	Absent	Absent
<i>F. religiosa</i>	Squarish	Arched	Straight	2-3	2-3	3-4	Complete closed cylinder	Present in complete closed cylinder	Absent	Absent

**Table2. Quantitative Features of Petiolar anatomy**

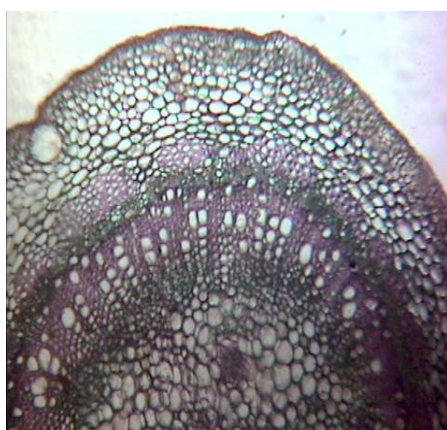
Name of taxa	Cross sectional area	Cross sectional area of vas.arc	Distance between sides to arc		Total visual count	Radial multiples vessels in main arc	Cross sectional area of vessels		Distance bet <sup>n</sup> two ends of arc
			Adaxial	Abaxial			Tangential	radial	
<i>A.nilotica</i>	854x198	336x409	266	196	30-36	2-3	41.32	28	Complete cylinder
<i>A.suma</i>	1134x1064	616x602	252	294	80-85	2-5	32	20	Complete cylinder
<i>A.marmelos</i>	1176x1008	756x1008	266	252	110-118	2-4	24	20	Complete cylinder
<i>F.bengalensis</i>	2828x4032	1344x2408	756	728	250-253	5-6	29	30	Complete cylinder
<i>F.religiosa</i>	1288x1400	602x756	308	378	140-145	4-6	26	24	Complete cylinder



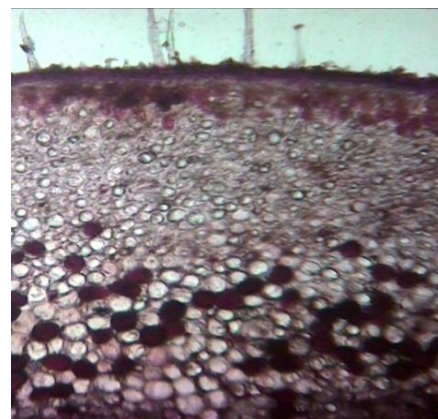
**Fig1.** T.S. of petiole of *A. nilotica*



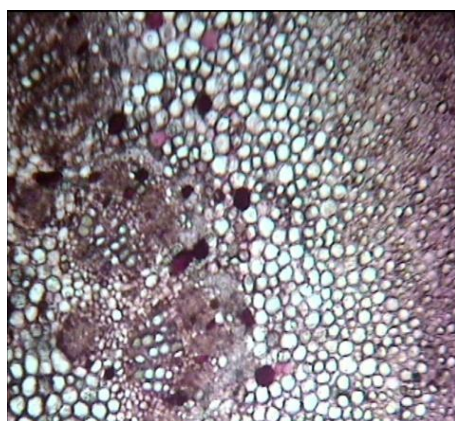
**Fig2.** T.S. of petiole of *A. suma*



**Fig3.** T.S. of petiole of *A. marmelos*



**Fig4.** T.S. of petiole of *F. bengalensis*



**Fig5.** T.S. of petiole of *F. bengalensis*



**Fig6.** T.S. of petiole of *F. religiosa*  
showing central region

#### 4. CONCLUSION

In determining relationship between different genera, families, orders and other taxonomic categories, the anatomical characters are most useful. Anatomical data have also solved several phylogenetic problems. Anatomical structures are most likely to provide evidences concerning inter-relationships of larger groups such as families and also helping to establish real affinities of their uncertain taxonomic status. There are large numbers of anatomical characters of systematic importance but as pointed out by Metcalfe and Chalk (1950), the systematic anatomist must rely on those characters which are less plastic.

The different vascular configurations in various taxa are taxon specific and hence can be utilized as a taxonomic marker. The variations in pattern in the petiolar anatomy of the different taxa are found to have some adaptive significance and would help in the identification and authentication of these medicinal plants on the basis of petiolar anatomy.

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**Rupali Subhashrao Kaikade**, is a research student of Botany. I completed my Post graduate (M.Sc) in 2008 with specialization Molecular Biology and completed Masters in Philosophy in 2010. Recently I submitted my Phd Thesis namely “Study of Phytochemicals and Anatomical Biomarkers of some Medicinal Plants Mentioned in Atharvaveda” under the guidance of Dr. Shubhangi N. Ingole in August 2014 and waited for the degree to be awarded. I worked as CHB (Clock Hour Basis) Lecturer and have 3 years of teaching experience. I also attended National and some International conferences and present a paper in the same.