Current Botany 2011, 2(9): 22-25
ISSN: 2220-4822
Available Online: http://currentbotany.org/

Petiolar anatomy in some Rhamnaceae

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Abstract

The present paper deals with the anatomy of 13 species belonging to seven genera of family *Rhamnaceae*. The anatomical characters of the petiole such as petiole outline, epidermal characteristics, number of layers of parenchyma cells in the cortex, pattern of vascular system, occurence of crystals, tannin, etc. provide data to distinguish the taxa investigated

Keywords: Petiole anatomy, *Rhamnaceae*

INTRODUCTION

Family *Rhamnaceae* consist of 45 genera and 550 species in the world (Lawrence, 1951). It is fairly investigated anatomically by Shisode and Patil (2000, 2005 a, b, 2008, 2009, 2010). The present paper communicates the anatomy of the petiole of 13 taxa belonging to seven genera of family *Rhamnaceae.* This information is useful in differentiation of taxa.

MATERIALS AND METHODS

The plant materials for present investigation were obtained from Kakra Beach (Goa), Amboli Ghat (Kolhapur District, Maharashtra), Government Botanical Garden, Waghai (Gujarat), Ooty (Tamilnadu), Mahabaleshwar (Satara District, Maharashtra), Chinchni Ghat (Nashik District) and Kothamalai hills (Tamilnadu). The fresh preserved and herbarium materials were used. The petioles were fixed in F.A.A. and preserved in 70% alcohol, Free hand sections of middle part of petioles were taken. They were stained in 1% safranin and 1% fast green combination and mounted in D.P.X. after the customary method of dehydration (Paliwal, 1974). Sudan IV was used to demarcate the cuticle. The prepared permanent slides were studied under Olympus research microscope. Topographic figures were drawn under low and high power, with the help of prizam type of camera lucida. They were inked by rotoring isograph pen. The permanent slides were deposited in the laboratory of L.V.H. College, Panchavati, Nashik-3.

Abbreviations Used: Chl: Chlorenchyma, Col: Collenchyma, Cr: Crystals, Sca: Secretory cavities, Tc: tannin cells, Vt: Vascular tissue.

* Herbarium materials were used.

Observations -

1) *Colubrina asiatica (L.) Brogn.* (Fig.1:)

It is circular in outline (In T.S.) with a deep channel adaxially. The epidermal cells are small, thick walled with moderately thick cuticle. Unicellular trichomes are distributed all over the petiole. Two layered chlorenchymatous hypodermis follows the epidermis. The cortex is broad, eight to ten layered and parenchymatous. The vascular cylinder is arc shaped. Only adaxial side of vascular bundle is covered by sclerenchyma. Tanniniferous cells are seen in ground tissue, secretory cavities of large and small size are common occurance in ground tissue.

2) *Gouania microcarpa DC.* (Fig.2:)

It is circular in outline with shallow channel adaxially. The epidermal cells are small thick walled wih thick cuticle. The single layered chlorenchymatous hypodermis follows the epidermis inside. The cortex is broader, parenchymatous and ten to twelve layered. A solitary vascular bundle is located in the centre. The vascular bundle is capped adaxially by sclerenchyma. The crystals and tanniniferous cells are common in ground tissue. The secretory cavities are present in the cortical region.

3) *Pomaderris apetala. Labill* (Fig.3:)

It is circular in outline. The epidermal cells are small, thick walled with a thick cuticle. Many stellate scales are distributed on the petiole surface. The epidermis is followed by sinlgle layered chlorenchymatous hypodermis. Cortex is broader & parenchymatous. White, hyaline crystals are present in some cells of cortex. The central vascular arc is capped by sclerenchyma. Tanniniferous cells are common in ground tissue and vascular region.

4) **Rhamnus wighti L.* (Fig.4:)

It is horse shoe shaped in outline. The epideramal cells are larger, thick walled and with a thick cuticle. Many unicellular trichomes with striations are present everywhere. The epidermis is followed by two layered collenchyma. The occurrence of collenchyma in the hypodermal region as a continuous ring in *Rhamnus wighti* is noteworthy. It may be inferred as a commensurate with the mechanical requirment of the organ in it. The cortex is very broad, consisting larger and smaller parenchymatous cells. In the centre an arc of vascular tissue is present which is completely surrounded by two to five layered sclerenchyma. Few secretory cavities are present in the cortex. Tanniniferous cells are seen in ground tissue and vascular tissue.

5) *Scutia myritina Kurz.* (Fig.5:)

It is nearly circular in outline with a shallow channel adaxially. The epidermal cells are small, thick walled with thick cuticle. The

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entire surface of petiole is studded by unicellular trichomes. The chlorenchymatous hypodermis is two layered and follows the epidermis. It is followed by six to eight layered parenchymatous cortex. A solitary prominent vascular arc is located in the centre. It is capped by two layered sclerenchyma. The tanniniferous cells are common in ground tissue.

6) *Ventilago bombayensis Dalz.* (Fig.6:)

It is circular in outline with two lateral wings and shallow concave channel adaxially. The epidermal cells are thick walled and with moderately thick cuticle. Few unicellular trichomes are present. The epidermis is followed by two layered chlorenchymatous hypodermis which is followed by cortex. Cortex is five to six layered and parenchymatous. A solitory continuous vascular cylinder is located in the centre which is surrounded by a ring of sclerenchyma patches. Pith is small and parenchymatous. Tanniniferous cells are abundent in cortex, sclerenchyma, vascular tissue and pith.

7) *Ventilago denticulata Willd* (Fig.7:)

It is circular in oultline with a shallow channel adaxially. The epidermal cells are small with moderately thick cuticle. Many multicellular trichomes are present all over the epidermis is followed by single layered sclerenchymatous hypodermis. The cells of cortex are larger. The central vascular arc is capped by sclerenchyma which is two to four layered. The crystals and tanniniferous cells are abundent in the cortex and pith.

8) *Ziziphus caracutta* Roxb. (Fig. 8:)

It is oval in outline. The epidermal cells are small, thick walled with a moderately thick cuticle. Many unicellular trichomes extended from the epidermis. It is followed by single layered chlorenchymatous hypodermal layer. Many layered parenchymatous cortex follows it from within. Conspicuous vascular arc is located in the centre. It is capped by sclerenchyma. The crystals and many tanniniferous cells are commonly found in the ground tissue. The secretory cavities are abundantly present everywhere.

9) *Ziziphus glabrata* Heyne ex Roth (Fig. 9:)

It is oval in outline. The epidermal cells are small, thick walled and with moderately thick cuticle. Many unicellular trichomes are distributed all over the petiole surface. It is followed by two layered chlorenchymatous hypodermis which is ultimately followed by many layered cortex. The outer region of cortex shows larger cells, whereas they are small inwards. The central vascular arc is capped by two to four layered sclerenchyma. Crystals and tanniniferous cells are common in cortical region. The secretory cavities are also abundant in ground tissue.

10) *Ziziphus mauritiana Linn (Fig. 10:)*

It is ovate in outline. The epidermal cells are small thick walled covered with thick cuticle. Few unicellular trichomes are present on the petiole. The epidermis is followed by two layered chlorenchymatous hypodermis which is followed by many layered cortex. The central vascular arc is capped by two to four layered sclerenchyma. The crystals and tanniniferous cells are common everywhere. The secretory cavities are likewise abundant in ground tissue.

11) *Ziziphus nummularia (Burm.f.) Wt. and Arn*. (Fig. 11:)

It is oval in outline. The epidermal cells are small, thick walled with thick cuticle. Unicellular trichomes are present. The epidermis is followed by single layered chlorenchymatous hypodermis. Many layers of parenchymatous cortex follows it from within. A solitary arc of vascular tissue is located in the centre which is capped by two layered sclerenchyma. Crystals and tanniniferous cells are common in ground tissue. The secretory cavities are also abundently present in the ground tissue.

12) *Ziziphus oenoplia (L.) Mill.* (Fig. 12:)

The petiole is flattish. The epidermal cells are small, thick walled and with a thick cuticle. Many unicellular trichomes and stomata interrupt the epidermis. The epidermis is followed by single layered chlorenchymatous hypodermis. Many layered parenchyma follow it from within. The central vascular arc is extensive and is capped by two layered sclerenchyma. The crystals and tanniniferous cells are amply present in cortical region. The secretory cavities are likewise abundent in it.

13) *Ziziphus rugosa Lamk.* (Fig. 13:)

It is oval in outline. The epidermal cells are small, thick walled and with a thick cuticle. Unicellular trichomes are present. The epidermis is followed by two layered chlorenchymatous hypodermis. It is then followed by many layered parenchymatous cortex. The central vascular arc is capped by two layered scelerenchyma. The crystals and tanniniferous cells are common in cortical region, as also the secretory cavities.

DISCUSSION

The petiole in the species investigated are generally circular, oval, ovate, horse-shoe shaped in outline (In T.S.). It is horse shoe shaped in *Rhamnas wightii* (Fig. 4), circular in *Colubrina asiatica* (Fig. 1), *Gouania microcarpa* (Fig. 2) and *Pomaderris apetala* (Fig. 3). It is flattish in *Ziziphus oenoplia* (Fig. 12). A deep channel is observed adaxially in *Colubrina asiatica* (Fig. 1). A shallow channel adaxially seen in *Gouania microcarpa* (Fig. 2), *Scutia myrtina* (Fig. 5), *Ventilago denticulata* (Fig. 7). Two lateral wings with a shallow concave channel are adaxially observed in case of *Ventilago bombayensis* (Fig. 6).

The epidermal cells are small and thick walled. They are moderately or thickly cuticularised. These cells are larger in *Rhamnas wightii* (Fig. 4). Many unicellular and / multicellular trichomes, stellate scales, stomata interrupt the epidermis. Unicellular striated trichomas are present in *Rhamnus wightii* (Fig. 4), whereas stellate scales are recorded only in *Pomaderris apetala* (Fig. 3). The unicellular and multicellular trichomes are found in most species of *Ziziphus* (Fig. 8 to 13).

The hypodermis is generally cholerenchymatous. It is one to two layered in majority of the species studied. It is two layered in *Rhamnus wightii (Fig. 4)*. The occurrence of collenchyma in the hypodermal region as a continuous ring in *Rhamnus wightii (Fig. 4)* is noteworthy. It may be defined as a commensurate with the mechanical requirments of the organ.

The vascular tissue is in the form of solitary arc in all the species studied. It is also recorded so rarely in the form of an arc of indistinct vascular bundles. In *Gouania domiegensii,* the petiolar vascular arc is accompanied by two latero-superior bundles (cortical bundles) (Metcalfe and Chalk, 1950). The same cortical bundles are recorded in *Maytenus senegalensis* and *Prianostemma aspera* in family the Celastraceae (Shisode and Patil, 2008). It is surrounded abaxially by two to three layered sclerenchyma. The cortex is parenchymatous it is generally four to six layered or more exceptionaly. The pith is small in *Ventilago bombayensis* (Fig. 6) and *Ventilago denticulata (Fig. 7).*

Many large and small secretory cavities are present in cortical

region in *Gouania microcarpa* (Fig. 2) C*olubrina asiatica* (Fig. 1), *Pomaderris apetala* (Fig. 3), *Rhamnus wightii* (Fig. 4) and abundent in species of all *Ziziphus* (Fig. 9 to 13). Tanniniferous cells are common in all species investigated. They are abundently present in all species of *Ziziphus*. Many crystals are recorded in *Gouania microcarpa* (Fig. 2), *Pomaderris apetala* (Fig. 3) and species of *Ziziphus* (Fig. 9 to 13).

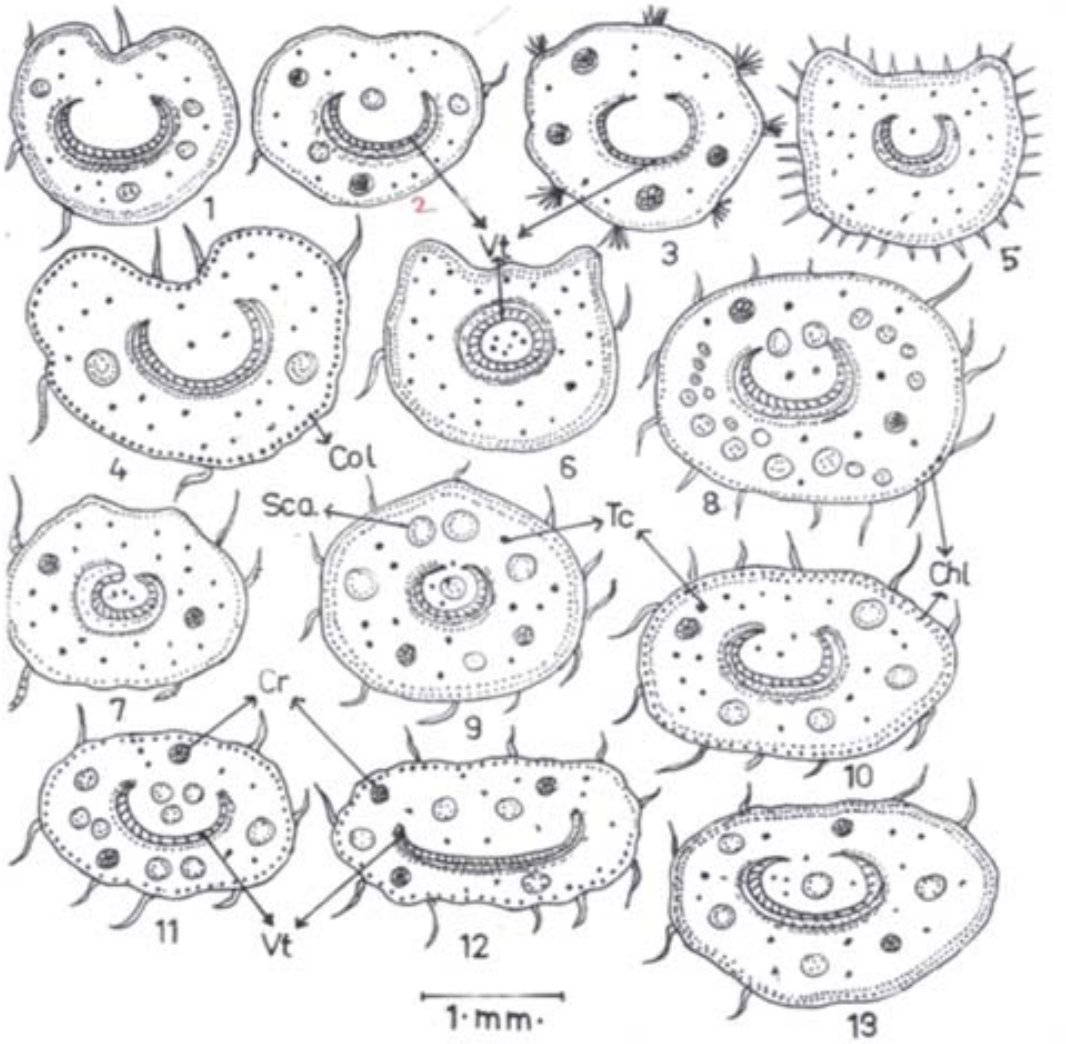

Fig 1 - *Colubrina asiatica.*
Fig 2 - *Gouania microcarpa.*
Fig 3 - *Pomaderris apetala.*
Fig 4 - *Rhamnus wightii*.*
Fig 5 - *Scutia myrtina.*
Fig 6 - *Ventilago bombayensis.*
Fig 7 - *Ventilago denticulate.*
Fig 8 - *Ziziphus caracuta.*
Fig 9 - *Ziziphus glabrata.*
Fig 10 - *Ziziphus mauritiana.*
Fig 11 - *Ziziphus nummularia.*
Fig 12 - *Ziziphus oenoplia.*
Fig 13 - *Ziziphus rugosa.*

ACKNOWLEDGEMENTS

The junior author (S.B.S) is thankful to Prof. S.R. Yadav (Shivaji University, Kolhapur) for collection of taxa and identification of some plant materials. He is also thankful to authorities of Government Botanic Garden, Waghai and Ooty for their help in collection of plant materials. He sincere thanks to Principal Bapusaheb S. Jagdale for laboratory facilities. Special thanks are tendered Mr. Pankaj G. Patil for technical help.

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