Journal of Ayurveda Medical Sciences

Refereed, Indexed, Peer reviewed, Open access, Quarterly Journal for Rapid Publication of Ayurveda and Other Traditional Medicine Research
Foliar Macro-micro-morphology of *Capparis zeylanica* L.

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**ABSTRACT**

*Introduction:* *Capparis zeylanica* L. (Ātontai) commonly referred as the Rasayana drug in traditional system of medicine is also used ethnomedicinally as a therapeutic agent. for variety of diseases throughout India. The present study was taken up to evaluate the macro- microscopically for the authentication of leaves of *Capparis zeylanica*. **Methods:** Dried leaves were collected from Mettur, Tamil Nadu. The macroscopic and microscopic details including powder were studied following the standard pharmacopoeial procedures. **Results:** Macroscopically leaves are pubescent with petiole containing small stipular spines. Microscopically, transverse section of the petiole consists of parenchyma, ceratenchyma and vascular bundles; midrib comprises of parenchyma, collenchyma and vascular bundles and lamina contains epidermis, differentiated mesophyll cells and embedded vascular bundles. Quantitative Microscopy was carried out and the epidermal number, stomatal number, stomatal index, vein islet number, vein islet ratio, palisade ratio were recorded. Powder microscopy of leaves showed the presence of wavy epidermal cells, stellate trichomes, parenchyma, groups of thick walled fibres, tracheids, spiral vessels and numerous stone cells. **Conclusion:** The study provides concise information on the pharmacognosy of *Capparis zeylanica* L.

**KEYWORDS** Ātontai, Indian Caper, Macro-microscopy atlas, Pharmacognosy.

**Received: 17.06.2017**  **Accepted: 21.06.2017**  **DOI: 10.5530/jams.2017.2.9**

**INTRODUCTION**

Herbal medicine has become a vital part of standard healthcare owing to its time tested traditional usage and ongoing scientific research and many of the medicinal plants are believed to enhance the natural resistance of the body to infections. *Capparis zeylanica* L. (family: Capparidaceae) commonly known as Indian caper, is a climbing shrub found throughout India and has been used as a ‘Rasayana/ Kayakalpam’ drug in the traditional medicine like Siddha and Ayurvedha, which is particularly recommended for the treating immune disorders. This plant is distributed throughout the major parts of India, Bangladesh and some parts of Pakistan. *C. zeylanica* known as Ātontai in Tamil is a branched thorny, sub-scandent climbing shrub attaining a height of 2-3 m in height with elliptic or broadly lanceolate leaves with base rounded, apex mucronate, flower profuse, pinkish white, later turning pink, berries globose or ellipsoidal, 3-4 cm in diameter, and seeds globose, embedded in white pulp. The whole plant of Ātontai is anodyne, sedative, stomachic, anti-hydropic, colic, cholagogue and used against swelling, pleurisy, cholera, hemiplegia, neuralgia and rheumatism. The roots and leaves are used in indigenous system of medicine. In Unani medicine, the decoction of the root bark is prescribed as deobstruent to liver and spleen and as an anthelmintic and anti-inflammatory agent. In Siddha it is used for the cure of tonsillitis. In Northern India, the leaves are widely used as counter-irritant, febrifuge and as a cataplasm in swellings, boils and piles; the plant contains saponin and p-hydroxybenzoic, syringic, vanillic, ferulic and p-coumaric acids. Modern phytochemical screening of the plant has shown the presence of fatty acids and flavonoids in the leaves. *C. zeylanica* methnolic leaf extract contains pharmacologically active substance responsible for anti-diureal properties.

**MATERIALS AND METHODS**

Botanically identified and authenticated dried leaves of *C. zeylanica* were procured from Mettur, Tamil Nadu. The macroscopy was documented by Nikon COOLPIX5400 digital camera. Part of the sample was preserved in FAA (Formalin-5ml + Acetic acid-5ml + 70% Ethyl alcohol-90ml) for sectioning and quantitative microscopy and the rest was powdered, passed through mesh no. 60, and preserved in an air-tight cover for powder microscopy. Transverse sections of the preserved specimens were hand cut using a 7 o clock platinum blade, stained with safranine and photographed using Nikon ECLIPSE E200 trinocular microscope attached with Nikon COOLPIX5400 digital camera under bright field light. Magnifications were indicated by the scale-bars. Leaf fragments were taken and cleared using 10% NaOH solution stained with safranine and mounted in glycerol to determine the quantitative anatomical parameters like epidermal number, stomatal number, stomatal index, palisade ratio, vein islet number, vein termination number and palisade ratio. A few leaves were powdered and a pinch of powder was mounted in glycerine on a clean microscopic slide. Slides of both quantitative and powder were observed under Nikon ECLIPSE E200.
trinocular microscope and diagnostic characters were identified and quantified. Individual characters of powder were magnified to 400X and photographed.\textsuperscript{10}

\textbf{RESULTS AND DISCUSSION}

Leaves are 2.5 to 7.5 by 1.8 to 5 cm, elliptic, oblong, obtuse, acute/retuse, apex mucronate, base, truncate, pubescent; petiole 6 mm to 1 cm long, densely pubescent, stipular spines small, hooked, in pair, recurved (Fig. 1).

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{Dried_leaves.png}
\caption{Macroscopy of \textit{Capparis zeylanica} L. leaves}
\end{figure}

\begin{table}[h]
\centering
\caption{Quantitative microscopy of \textit{Capparis zeylanica} L. leaf}
\begin{tabular}{|c|c|c|}
\hline
Parameter & Upper epidermis & Lower epidermis \\
\hline
Epidermal number & 380 & 420 \\
\hline
Stomatal number & - & 160 to 210 per mm\textsuperscript{2} \\
\hline
Stomatal index & - & 28 to 32 \\
\hline
Palisade ratio & & 0.75 to 1 \\
\hline
Vein-islet number & 6 to 7 per mm\textsuperscript{2} \\
\hline
Vein termination number & 38 to 41 per mm\textsuperscript{2} \\
\hline
\end{tabular}
\end{table}

Microscopy of leaf

\textit{Petiole}

TS of petiole is oval in outline with a prominent notch on the upper surface; there is a single layered thick walled epidermis with coating of cuticle; cortex is made up of wavy walled parenchymatous cells without intercellular space; prominent region of ceratenchyma is seen surrounding the central vascular bundle; phloem shows a few isolated or groups of stone cells; the vascular bundle occupies the major area of the section with prominent xylem tissue formed by normal elements interrupted by 2 to 3 seriate xylem rays running to the central pith like region filled with ceratenchyma (Fig. 2.1 to 2.4).

\textit{Midrib}

TS shows a prominent midrib with almost flat surface with undulations on upper side and a broad elevation on the lower side; there is a single layered epidermis with thick cuticle on the outer walls; beneath the upper epidermis there is a patch 4 to 5 layers of parenchyma; beneath the lower epidermis there is 5 to 6 layers of collenchyma followed by 5 to 6 layers of parenchymatous ground tissue which often shows a few narrow lumened stone cells; the cordate vascular region is protected by pericycle which is fully formed continuous patch of thick walled fibres, few outer ones being stone cells; at the centre there are 10 to 12 vascular bundles formed by phloem at the lower side and xylem tissues towards the upper side, few 2 to 3 seriate ray strands separates the vascular bundles from each other (Fig. 2.5, 2.7 & 2.8).

\textit{Lamina}

TS through lamina shows dorsiventral structure with protection of single layered upper and lower epidermii; underneath upper epidermis which is devoid of stomata there is a single layer of palisade followed by about 10 layers of loosely arranged spongy parenchyma cells together forming mesophyll tissue; few vascular bundles are embedded in the mesophyll tissue which are composed of normal elements of phloem and xylem (Fig. 2.6).

\textbf{Quantitative microscopy}

Quantitative microscopic features of the leaf has been recorded for authentication of the drug from allied species or other adulterants and substitutes (Table 1 and Fig. 3).
Figure 2. Detailed microscopy of *Capparis zeylanica* L. leaf

2.1. TS of petiole

2.2. A portion of TS enlarged

2.3. Outer region of TS of petiole

2.4. Central region of TS of petiole

2.5. A portion of TS of midrib enlarged

2.6. A portion of lamina enlarged

2.7. Upper region of TS of midrib enlarged

2.8. Inner region of TS of midrib enlarged

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Epidermis; Cer – Ceratenchyma; Col – Collenchyma; E – Cortex; Ct – Cuticle; E – Epidermis; GT – Ground tissue; LE – Lower epidermis; Me – Mesophyll; Pal – Palisade cells; Per – Pericycle; Ph – Phloem; Pi – Pith; SC – Stone cells; SP – Spongy parenchyma; Tr – Trichome; VB – Vascular Bundle; Ve – Vessel; XR – Xylem rays; Xy – Xylem.
Figure 3. Quantitative microscopy of Capparis zeylanica L. leaf

3.1. Upper epidermis
3.2. Lower epidermis
3.3. Islets and terminations

E – Epidermis; ST – Stomata; VI – Vein islet; VT – Vein termination.

Powder microscopy shows the presence of wavy epidermal cells, stellate trichomes, parenchyma, groups of thick walled fibres, tracheids, spiral vessels and numerous stone cells (Fig. 4); greenish yellow in colour, odour and taste nil.

Figure 4. Powder microscopy of Capparis zeylanica L. leaf

A - Epidermal cells in surface view; b - Stellate trichome; c - Transversely cut lamina; d - Epidermis of petiole in surface view; e - Transversely cut petiole; f - Parenchyma of the cortex of petiole; g - Stone cells; h - Fibre bundle; i & j - Tracheidal fibres; k - Thick walled fibre; l - Vessel fragment.

CONCLUSION
This study has illustrated the macroscopy and microscopy details of Capparis zeylanica L. leaf with pictorial information for identification of the drug using unaided eye and/or a microscope.

ACKNOWLEDGEMENT
The authors extend their heartfelt thanks to Director General, CCRS, Chennai for the support and Dr. M Padma Sorna Subramanian, Research Officer, Siddha Medicinal Plants Garden, Mettur for proving the samples.

CONFLICT OF INTEREST
Nil
REFERENCES


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GRAPHICAL ABSTRACT


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