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RESEARCH ARTICLE

STUDY ON ANATOMICAL CHARACTERIZATION OF *MICROCOCCLUS PANICULATA* L.

**Hari N.¹, Anakha Manoj², Mahima A. Varghese², Navin Peter K.², Princy Thankachan², Shibimol Sabu²,
Abhijith Muraleedharan² and Arunkumar G.³**

1. Associate Professor in Botany, C M S College Kottayam (Autonomous), Kottayam, Kerala, India-686001.
2. Department of Botany, C M S College Kottayam (Autonomous), Kottayam, Kerala, India-686001.
3. Assistant Professor in Botany, the Cochin College, Cochi, Kerala, India-682002.

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Abstract

Micrococcus paniculata L., one of the important medicinal plants, commonly known as Cherikkotta, Kotta, Kottakka or Pottanga, of plant family Tiliaceae and are generally seen at the steep forested regions and also in scared grooves. The plant parts were utilized for the treatment of variety of diseases or conditions, including dysmenorrhea, paratyphoid, bone fractures, jaundice, kidney stones, dyspepsia, heat stroke, cold, fever, diarrhoea, hepatitis B, ingestion, and anthelmintic medication. It is widely distributed along the Western Ghats of India. Eventually, complete identification and authentication of plant material is needed to avoid confusion of species by non-taxonomist. Anatomical study supplement classical methods of identification. Specimen were examined by morphological and anatomical characteristics. Leaf and petiole anatomical profiling of this species *Micrococcus paniculata* occurring in of Kerala was investigated in this study. The study aims to search for the stable features marking out *Micrococcus* species. The species were distinguished based on the anatomical difference in the vascular bundles in midrib and petiole, palisade layer and type of stomata. The anatomical features of stem might be very useful for the identification of this plant species. Through this anatomical study, we concluded that this species has some unique features to its environmental habitat.

Corresponding Author: - Dr. Hari N.
Address: - drhari@cmscollege.ac.in

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Introduction:-

Micrococcus (*Grewia*) a medicinal plant, generally seen at the steep forested regions and also in scared grooves. The plant parts were utilized as a treatment for variety of diseases or conditions, including dysmenorrhea, paratyphoid, bone fractures, jaundice, kidney stones, dyspepsia, heat stroke, cold, fever, diarrhoea, hepatitis B, ingestion, and anthelmintic medication. It is widely distributed along the Western Ghats of India. Although it has been commonly used in traditional medicine. This species is known with heterotypic synonyms and sibling species leads miss identifications and also the use of adulterant in pharmacological level. The overall anatomical characteristics have not been scientifically evaluated. So, this research aims to investigate the anatomical characteristics of the shrub.

Relevance.

The current status of the species seeks proper conservational measures for the protection. The histological profile reveals about the peculiar superficial and anatomical characters of the species. The evaluations are essential in describing and tracing various ultrastructure developments of plant parts. The anatomical study helps to identify the diverse nature in relation to their environmental impact.

Objectives: -

1. To establish an anatomical profile (Microscopy) on Leaf characters.
2. Micro morphological characters of (SEM) Lower Epidermis of Leaf.
3. To establish an anatomical profile (Microscopy) on Leaf Midrib characters.
4. To establish an anatomical profile (Microscopy) on Leaf Petiole characters.
5. To establish an anatomical profile (Microscopy) on Stem characters.

Materials and Methods: -

Materials were collected from C M S College Campus, Kottayam (N 09° 35' 50.44", E 076° 31' 20.73") Kottayam District in Kerala. The leaf and stem samples were freshly used for the anatomical studies (Plate-1).

Botanical Name:

Micrococcus paniculata L. [*Grewia nervosa* (Lour.)]. **Family** (Bentham & Hooker): Tiliaceae: **Family** (APG): Malvaceae. **Habit**: Shrub to Small Tree: **Habitat**: Semi-evergreen forests, sacred groves and scrub jungles. **Altitude**: 400-700 Meters. **Location**: All Districts in Kerala. **Flower**: White, Yellow. **Fruit**: Dry. **Distribution**: Tropical Asia. **Native to**: Andaman Is., Assam, Bangladesh, Cambodia, China South-Central, China Southeast, East Himalaya, Hainan, India, Laos, Lesser Sunda Is., Malaya, Myanmar, Nicobar Is., Pakistan, Sri Lanka, Thailand, Vietnam. Local Name (Malayalam): Cherikkotta, Kotta, Kottakka, Pottanga.

Local Name (English): Shiral. Local Name (Tamil): Kadambu, Visalam. **Flowering and Fruiting**: August-April. **Others**: It is a Medicinal plant.

Description:

Erect bushy shrubs to small tree; young stem, petioles, peduncles and calyx densely stellate pubescent. Leaves simple, alternate, 6-18 x 3-5.5 cm, elliptic-oblong or ovate-lanceolate, apex acute to acuminate, base rounded or cordate, margins subentire to serrulate, densely stellate hairy when young, glabrous on ageing except the nerve on both sides; 3-ribbed; petioles up to 1 cm long. Flowers in axillary and terminal panicles; pedicels c. 1 mm long; bracts 5-6 mm long, linear-lanceolate. Sepals 5, free, 4-6 mm long, oblong-obovate, tomentose without. Petals 5, yellow, 2-3 mm long, ovate. Stamens many; filaments 3-4 mm long. Ovary 1 mm across, globose, 2-4-celled; ovules 2 in each cell. Drupe 6-10 mm across, globose, purple on ripening; seeds 1 or 2.

Methods: -

Anatomical studies: The distribution of different histological layers of cells like epidermis, cortex, vascular bundles, pith, etc., was observed from the microscopic examination. All the sections were observed and images were taken by using Magnus MLXi Plus microscope and Magnus camera adapter.

Anatomical studies of Leaf, Petiole and Stem.

The transverse sections of the midrib and lamina were taken, stained with safranin and mounted in glycerine. The micro-preparations were observed under the microscope. The transverse sections of the petiole were taken and stained with safranin mounted in glycerine and observed under microscope for taking micro-photographs. The epidermal peel was taken to study the leaf surface characteristics and the stomata. To prepare paradermal sections of leaf, 3 cm² sized portion from the middle part of mature lamina including leaf margin. Peeled off leaf surfaces were stained with safranin in 50% alcohol for about 2 minutes before mounting.

Handmade sections of leaf lamina, midrib, petiole and stem were stained in 1% safranin and washed in 50% alcohol to remove the excess stain. The microscopic observations through the transverse section (T.S), radial longitudinal section (R.L.S) and tangential longitudinal section (T.L.S) of the stem were done, using the same staining procedure. Sections were mounted in 50% glycerine. All the samples were analysed using Magnus MLXi Plus microscope equipped with Magnus camera adapter. The terminology followed by International Association of Wood Anatomists.

Results: -**Organoleptic Characters of Leaf.**

The following table shows the organoleptic characters of *Micrococcus paniculata* L. For the easy identification of plant, primarily organoleptic evaluation was done in easiest and fastest way (Table-1).

Table 1: - Organoleptic characteristics of *Micrococcus paniculata* L.

Characters	<i>Micrococcus paniculata</i> L.
Colour	Green
Shape	Ovate-lanceolate
Odour	Pungent
Texture	Smooth
Apex	Acute to acuminate
Base	Rounded or cordate
Margin	Subentire to serrate
Venation	Reticulate
Petiole	Petiolate

Anatomy of Leaf Lamina.

The leaf lamina with thick cuticle. The upper epidermis is moderately bigger in size than the lower epidermis. The lower epidermis showed number of stomata. Inner to the upper epidermis, palisade tissues were present. The lower side of the lamina having loosely packed spongy parenchyma cells with large air space. Both the palisade and spongy cells were highly chlorophyllated in nature (Plate-1).

Micromorphology of Lower Epidermis.

Stomata were numerous in number and rubiaceous (paracytic). Stomata were confined to abaxial surface and are hypostomatic. The SEM analysis showed protruding (Elevated) stomata and having ellipsoid shape. The whole stomatal unit with an average length of 14.67 μm and width of 10.08 μm . The posterior and anterior sides of stomata possess cuticular striations (Plate-1).

Anatomy of Midrib.

The upper part of the midrib showed Collenchymatous tissue. The upper and lower epidermis were very narrow in size and slightly cuticular in appearance. The adaxial side of midrib showed the extension of leaf lamina and the chlorenchyma cells were restricted only in this part. Midrib showed the 'U-shaped' vascular zone. The upper part of vascular region showed the inter-fascicular parenchyma. Thick walled medullated pith is present. The vascular region showed linear xylem vessels. Outer to xylem, the phloem was present. The phloem showing a continuous layer of phloem fibers. The vascular region is clearly delimited by the endodermis. The lower side of midrib showed a wider parenchymatous cortex (Plate-2).

Anatomy of Petiole.

Petiole showed a continuous epidermis. Inner to the epidermis, multilayered collenchymatous hypodermis were present. The inner cortex showed the chlorenchymatous tissue. Vascular zone become appeared as a complete ring having both xylem and phloem. A clear ring of endodermis is present. Thick walled medullated pith is present. The xylem vessels are arranged as linear fashion. The phloem present outer to xylem and have a continuous layer of phloem fibers (Plate-2).

Anatomy of Stem.

The stem showed the secondary growth in thickness. The extrastelar region shows the periderm formation. The phellum, phellogen and phellogen were clearly differentiate. The outer region of stele showed the dilated primary phloem. The secondary phloem intercalated with the early formed phloem tissues. The secondary xylem elements were differentiated with solitary xylem vessels. The vessel elements are very narrow in size. The stele with more tracheids and with xylem parenchyma. The medullary rays are moderately wide. The reduced thick-walled pith with prismatic crystals (Plate-3).

Stem R. L. S. and T. L. S.

The radial longitudinal section (R.L.S.) showed wider vessels with simple perforations. The lateral walls of vessels showed bordered pits. Xylem parenchyma and tracheids were present. The tracheids are smaller and with narrow lumen (Plate-1). The tangential longitudinal section showed parenchymatous ray cells. The fibres and parenchyma are shorter in size. The ray cells showed the deposition of prismatic crystals (Plate-3).



Plate-1. Habit and Anatomical Characteristics of *Micrococcus paniculata* L. a. Habit; b. Lamina; & c. Stomata.



Plate-2. Anatomical Characteristics of *Micrococcus paniculata* L. a. Midrib; & b. Petiole.

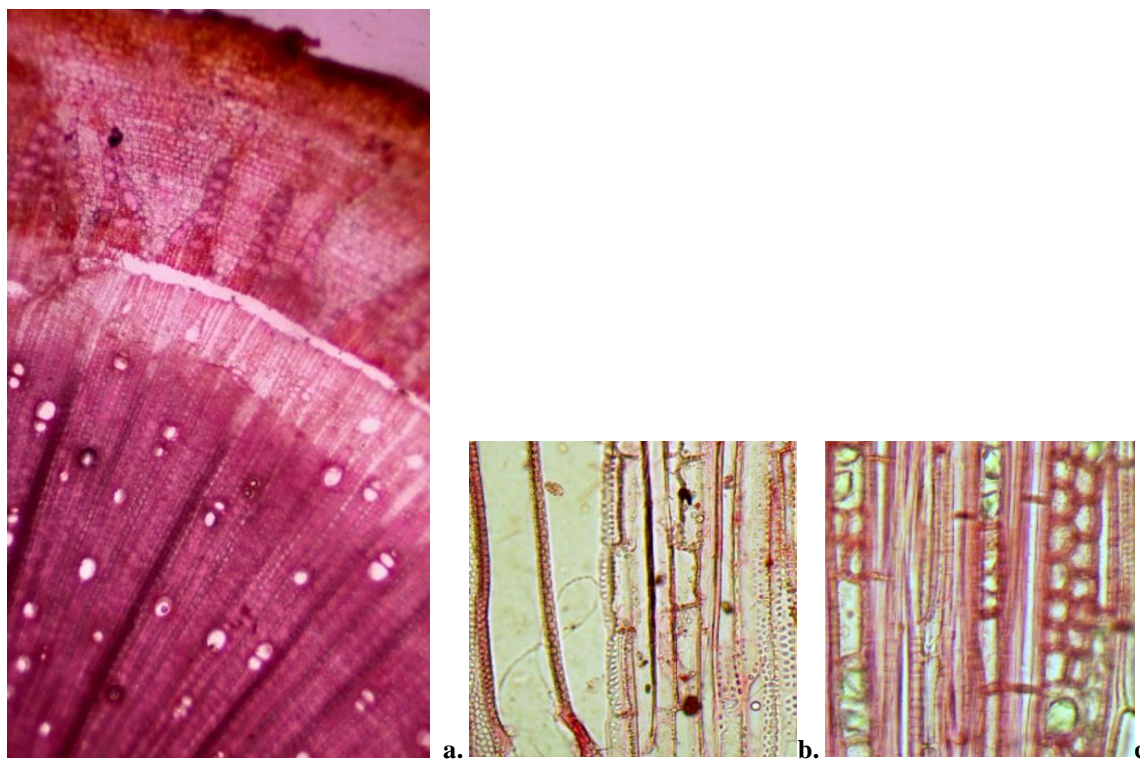


Plate-3. Anatomical Characteristics of *Micrococcus paniculata* L. a. Stem; b. R.L.S.; & c. T.L.S.

Discussion: -**Anatomical Characters of Leaf.**

The leaf tissue differentiation, stomatal pattern and distribution of stomata become a specific characteristic to identify the species. The leaf is, therefore, an exceedingly important organ (Eames, 1961).

Anatomical Characters of Petiole.

The difference in vascular structures lies chiefly in the arrangement of the xylem and phloem. The role of petiole vasculature in proving taxonomic interrelationship. The petiole anatomy, is of considerable taxonomic importance, since its structure is least affected by the environment (Metcalf & Chalk, 1950).

Anatomical Characters of Stem.

The role of vasculature in proving taxonomic interrelationship was documented in this species. The peculiar appearance of dilated primary phloem, solitary vessel element and deposition of prismatic crystals were the key identification of the species. Conserved characteristics with systematic affinities in stem anatomy, especially in the secondary xylem components (Carlquist, 2013).

Summary and Conclusion: -

The organoleptic characters, macro and micro anatomical characteristics of leaf, midrib and petiole anatomy and stem and wood characteristics were proved that it helps to identify this species. It might help to isolate from adulterant and sibling species.

This study helped to overcome the taxonomic difficulty for the identification, while reproductive structures were absent. The use of anatomical features, it was proved that it become a cheapest and easiest method for the precise identification of this species, even from a fresh and/or dried specimen.

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