Preliminary Pharmacognostic Standardization of *Sebastiania chamaelea* (L.) Mull. Arg. (Malayalam name – *Kodiyaavanakku*)

Honey Thomas¹, P Y Ansary², Shincy Mol. V V³

¹PG Scholar, Department of Dravyagunavijnanam, Government Ayurveda College Tripunithura,, Kerala University of Health Sciences, Trissur, Kerala, 680596
²Professor and HOD, Department of Dravyagunavijnanam, Government Ayurveda College Tripunithura,, Kerala University of Health Sciences, Trissur, Kerala, 680596
³Associate Professor, Department of Dravyagunavijnanam, Government Ayurveda College Tripunithura,, Kerala University of Health Sciences, Trissur, Kerala, 680596

Email: honeythomas83 @ yahoo.in, dransarypy @ gmail.com, vvshincymol @ gmail.com

**Abstract**— The drug *Sebastiania chamaelea* (L.) Mull.Arg. is an indigenous part of the local flora in the Asian, Australian and African countries. It is known for its medicinal efficacy and is used widely in the folklore clinical practices. The drug is mentioned in the books Hortus Malabaricus and Yogamrutham. An entry point of this drug to the frontline Ayurvedic clinical practice is the validation of pharmacological ties of the drug. The observation from the macroscopic and microscopic evaluation of the root, stem, leaves, inflorescence, fruit and seed was noticed with that of the available descriptions of these parts in the authentic books and journals. Powder microscopic characters identified include the calcium oxalate crystals, sclereids, fibres, tracheids etc. This study resulted in providing an updated pharmacognostical standards for the drug *Sebastiania chamaelea* (L.) Mull.Arg.

**Keywords**— Macroscopical evaluation; Microscopical evaluation; Sebastiania chamaelea (L.) Mull.Arg.; Histochemical evaluation.

I. INTRODUCTION

*Sebastiania chamaelea* (L.) Mull. Arg. belonging to Euphorbiaceae family is a perennial herb or subshrub widely distributed in Asian countries like India, Sri Lanka, North Australia and Africa.¹ The plant is regionally called as *Kodiyaavanakku* and is used in the folklore medicinal practices because of its effluent medicinal value. Ayurvedic lexicons somehow missed to coin the drug *Sebastiania chamaelea* (L.) Mull.Arg. or its uses throughout. The initial mentioning of the drug along with its medicinal value was noticed in Hortus Malabaricus of Van Rheede.² A good pictorial representation of the plant is given in the book. The drug is mentioned in the name ‘Codi Avanacu’ (‘Kodi’ means banner, referring to its erect stem; and ‘Avanakku’ refers to Ricinus communis). Malabaris called it as Codi Avanacu because of its erect stem. Brahmins named this drug as Boi-Erando as it means humble Avanacu. Its medicinal uses are described in an Ayurvedic textbook so called Yogamrutham.³ *Kodiyaavanakku* is widely used in the Kurkidaka kanji, a unique medicinal porridge traditionally popular in the South Indian state of Kerala during the monsoon season. It is considered as an endangered species by Medicinal plant genetic resources of Bangladesh – genera represented by single species and their conservation needs.⁵ Prior works on the pharmacognostical evaluation of the drug have been done by N Yasodamma et al.⁶, and Anjali Asok.⁷ Presently the drug *Sebastiania chamaelea* (L.) Mull.Arg. have been sidelined from the Ayurvedic medicinal practices due to the lack of scientific exploration on its pharmacological properties using the Ayurvedic formulations. So as to meet the rising need of herbal medicines with pharmacologically efficient drugs, validating the local flora became an inevitable task. As a first step for the same scientific validation for the identity of the drug is essential. With this aim, this study intends to update the pharmacognostical characters of the whole plant *Sebastiania chamaelea* (L.) Mull.Arg. for its proper identification.

II. MATERIALS AND METHODS

A. Collection of plant material

The plant *Sebastiania chamaelea* (L.) Mull.Arg. (Malayalam name – Kodiyaavanakku) was positively identified and collected from the premises of Government Ayurveda College, Tripunithura, Ernakulam district, Kerala. It was then washed with water thoroughly to remove physical impurities. A part of the collected drug was dried well under shade. Properly dried drug was then made to a fine powder and passed through a sieve of 120 mesh size.

B. Pharmacognostical evaluation

This evaluation consist of three phases - a. Macroscopic evaluation. b. Microscopical evaluation, c. Histochemical evaluation

a. Macroscopic evaluation

It include macroscopic evaluation of root, stem, leaves, flower, fruit and seed of the drug and also the powder of the whole plant. 

*Materials:* Magnifying lens and dissecting microscope were used for the purpose. 

*Procedure*

The root, stem, leaves, flower, fruit and seed powder of the whole plant were subjected to macroscopic evaluation by observation with naked eyes, by tactile and other sensory inspection. A magnifying lens with a dissecting microscope was used for a better evaluation of surface characters.

*b. Microscopic evaluation*

Microscopic evaluation was be carried out in two phases – i. Histological evaluation, ii. Powder microscopy

i. **Histological evaluation**

*Materials:* Sharp blades, Safranin stain, glass slides, water, cover slips, glycerine, petri dishes, watch glass, brushes, needles and digital microscope. 

*Procedure:*

For microscopical evaluation, thin section of each part (root, stem, leaf, petiole, fruit and seed) was taken using a razor blade. As per standard procedure staining was done using the Safranin stain and the slides were prepared. The prepared slide was then examined under a compound microscope and images were taken at 4x, 10x and 40x magnifications.

ii. **Powder microscopy**

*Materials:* Powdered drug, glass slides, cover slips, microscope, glycerine and safranin stain.

*Procedure:*

For examining characters of the powder, sufficient amount of powder of samples were mounted on a glass slide after mixing with glycerine. The slide was then examined under a compound microscope for examination of powder characters and images were taken at 4x, 10x and 40x magnification.

*c. Histochemical evaluation*

Handmade sections of root, stem, leaf and petiole of the drug were stained with the reagents for localizing the histochemical constituents. The stains used were Sudan red, Phloroglucinol. HCl, Iodine, Ferric chloride test.
It have regularly arranged protuberances of glands. Flowers are devoid of odour but have bitter taste.

5. Fruit of Sebastiania chamaelea (L.) Mull. Arg.

Macroscopical characters of fruit of Sebastiania chamaelea (L.) Mull. Arg. has been done (Fig. 6). The fruit was subglobose in shape with 3 lobes. It was green colour that turns to orange to brown and 3.5-4.5 mm long and 2.5 mm broad. It had long excrescences that arranged in 6 rows, 2 rows in a lobe and with 5 to 6 spine in a row. The fruit have no odour but possess sour taste and was easily breakable to three lobes.


Macroscopical characters of seed of Sebastiania chamaelea (L.) Mull. Arg. has been done (Fig. 7). In a single fruit 3 oblong seeds were present with yellowish brown colour and white mottled surface. Each seed was 2.5-2.15 mm long and 2-2.25 mm broad. The seed had a caruncle and was smooth in touch with astringent taste. The seed was devoid of any odour.


Macroscopical characters of powder of the whole plant Sebastiania chamaelea (L.) Mull. Arg. has been done (Fig. 8). The choorna was light brown coloured and fibrous in appearance. It had a characteristic odour with astringent-bitter-sour taste. The observations are tabulated below:

<table>
<thead>
<tr>
<th>Features</th>
<th>Powder of whole plant Sebastiania chamaelea (L.) Mull. Arg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Light brown</td>
</tr>
<tr>
<td>External appearance</td>
<td>Characteristic</td>
</tr>
<tr>
<td>Odour</td>
<td>Astringent and Bitter</td>
</tr>
<tr>
<td>Taste</td>
<td>Astringent and Bitter</td>
</tr>
</tbody>
</table>

B. Microscopical Evaluation

i. Histological evaluation

1. Root of Sebastiania chamaelea (L.) Mull. Arg.

The transverse section of root was almost circular in outline and consists of outer cork, middle cortex and inner stele region. The cork was composed of 3-5 layers of cells. Cortex consists of large irregularly shaped parenchymatous cells with intercellular spaces. Also had peripheral fibres.
Inner stele region was composed of vascular bundles. They were arranged radially with exarch xylem. Primary xylem was embedded in the secondary vascular tissue. Presence of medullary rays and absence of pith was observed. (Fig. 9)


The Transverse section of stem was almost circular in outline with outer epidermis, middle cortex and inner stele. Epidermis was composed of single layered parenchymatous rectangular cells covered with cuticle and trichomes were absent. (Fig. 10).

Epidermis is followed by 3-4 layered thick walled collenchymatous hypodermis. Below hypodermis lies the outer cortex and characterized by loosely packed 2-3 layered chlorenchymatous cells. Next to the outer cortex comes the inner cortex with 1-2 layers of parenchyma cells with rosette crystals of calcium oxalate.

In the stele region, perivascular fibre patches made of few sclerenchyma cells are located peripheral to the phloem. Primary phloem appeared to be crushed and secondary phloem was 2-3 layered. Secondary xylem forms a continuous ring with numerous vessels arranged solitary or radially in groups of 2-4. Medullary rays were narrow and uniseriate. The centre was occupied by a wide and almost circular pith composed of parenchymatous cells with rosette crystals of calcium oxalate and starch granules.

3. Leaf of *Sebastiania chamaelea* (L.) Mull.Arg.

In the transverse section of leaf single layered epidermis was present on both upper and lower surface and they were covered by cuticle. Cuticle on the lower epidermis appeared thin compared to that over the upper epidermis. (Fig. 11)

The lamina part have epidermal hairs, more in the lowers surface. The mesophyll layer, differentiated into upper palisade tissue and lower spongy parenchyma. Palisade tissue constitute the major portion and composed of 1-2 layered, columnar cells compactly packed without intercellular space and contains chloroplasts. Lower spongy parenchyma cells were irregular in shape and loosely packed with intercellular space. Cluster crystals of calcium oxalate were present in this layer.


In the transverse section, petiole was covered throughout with uniseriate epidermis with occasional appearance of trichomes. Collenchyma cells were arranged just beneath the epidermal layer. Presence of three sets of vascular bundles arranged in a crescent shape and middle one being large in size. Xylem and phloem were arranged towards the adaxial and abaxial side respectively. Vascular bundles were surrounded by parenchyma cells. Rosette crystals and cluster crystals were found in parenchyma cells. (Fig. 12)

5. Fruit of *Sebastiania chamaelea* (L.) Mull.Arg.

The pericarp of the transverse section of the fruit showed uniseriate exocarp with multicellular appendages. The mesocarp was made of outer parenchymatous layer middle elongated and thin walled cells and inner palisade cells. The endocarp composed of sclerenchymatous cells resembles the middle mesocarp layer. Centre columnella have vascular bundles on its three septa. Also it have parenchyma cells and sclerenchyma cells. (Fig. 13).
6. **Seed of Sebastiania chamaelea (L.) Mull.Arg.**

The seed is covered by seed coat called testa. Inner to testa lies the endospermic layer and inner to the endospermic layer lies the cotyledons. Cotyledons are thin and broad. (Fig. 14).

![Image of seed structure](image)

**Fig 14a.** Testa, b- endosperm, c- cotyledon

### B.2. Powder microscopy

Powder of the whole plant *Sebastiania chamaelea* (L.)Mull.Arg. was observed microscopically to identify the structures included in it. The structures identified were acicular and cluster crystals of calcium oxalate, sectional view of cork cells, epidermal cells of leaf with stomata, epidermal cells of midrib, epidermal cells of petiole in surface view, pitted parenchyma, fibres, medullary rays, sclereids, stone cells, stomata, starch grains, spiral vessels, rosette crystals and parenchyma cells. (Fig 15)

### C. Histochemical Evaluation

Presence of lignin, oil, starch and tannins were identified using the histochemical analysis of the TS sections of stem, root, leaf and petiole of the drug *Sebastiania chamaelea* (L.)Mull.Arg. They are tabulated below:

<table>
<thead>
<tr>
<th>Test for</th>
<th>Stem</th>
<th>Root</th>
<th>Leaf</th>
<th>Petiole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lignin</td>
<td>Cortex, Pithoxylem</td>
<td>Cork, Cortex, Vascular bundle</td>
<td>Upper Epidermis, Lower Epidermis, Vascular bundle</td>
<td>Epidermis, Vascular bundle</td>
</tr>
<tr>
<td>Oil</td>
<td>Cortex, Vascular bundle, Pith</td>
<td>Cork</td>
<td>Vascular bundles</td>
<td>Vascular bundles</td>
</tr>
<tr>
<td>Starch</td>
<td>Cortex, Medullary ray, Vascular bundle, Pith</td>
<td>Secondary phloem</td>
<td>-</td>
<td>Cortex, Parenchyma cells</td>
</tr>
<tr>
<td>Tannin</td>
<td>Epidermis, Cortex, Vascular bundles, Pith</td>
<td>Cortical cells, Vascular bundle, Pith</td>
<td>Ground tissue, Palisade and Spongy parenchyma cells</td>
<td>Epidermis, Collenchyma cells, Vascular bundles</td>
</tr>
</tbody>
</table>

### IV. DISCUSSION

In order to update the pharmacognostical standards of *Sebastiania chamaelea* (L.) Mull.Arg, root, stem, leaves, flowers, fruit, seed and petiole of the drug was subjected to pharmacognostical evaluation. It includes macroscopic and microscopic evaluation of the plant parts, along with the macroscopy and microscopy of powder of the whole plant *Sebastiania chamaelea* (L.) Mull.Arg. The taxonomonic features of the plant was compared with the description of authentic botany text books like Indian Medicinal Plants-Kritikar and Basu, Flora of Presidency of Madras, Flora of British India as well as the descriptions in the research journals like International Journal of pharmacy and pharmaceutical sciences, Ayushdhara, Blumea - Biodiversity, Evolution and Biogeography of Plants. The macroscopic features of the whole plant were found similar and the drug has been botanically identified as *Sebastiania chamaelea* (L).Muell. Arg. in the Department of Dravyagunavijnanam, Government Ayurveda College, Tripunithura. The whole plant, *Sebastiania chamaelea* (L.) Mull.Arg. was collected during the month of November. Being an annual herb, even though the aerial parts die, the plant again developed from dispersed seeds and roots remnants within the soil, when adequate water and sunlight is available.

The microscopic features of stem, root, leaf, petiole, fruit and seed of the drug observed from the study was compared with that of the descriptions obtained from research journals like International Journal of pharmacy and pharmaceutical sciences, Ayushdhara etc. In addition to the descriptions available from these journals, chlorenchyma cells, rosette crystals of calcium oxalate, perivascular fibre patches and starch grains in the T.S of stem, peripheral fibres in the T.S of root, cluster crystals of calcium oxalate, rosette crystals of calcium oxalate in the T.S of leaf, were identified in the present work. The descriptions regarding the T.S of petiole and T.S of seed was not available from any previous research papers.

The histochemical localization of lignins, oils, starch and tannins in the cells of different parts of the drug *Sebastiania chamaelea* (L.) Mull.Arg. was done. The results were...
compared to that obtained from the research journal, International Journal of pharmacy and pharmaceutical sciences and found that the drug was not exhausted. In addition to the results from the research journal, in the present work, lignins were localized in the cork of root, starch grains were localized in the cortex, medullary ray and vascular bundles of stem. Tannins was found in the cortex and pith of stem and also in cortical cells, vascular bundles and pith of root.

Macroscopical and microscopical evaluation of the powder of the whole plant *Sebastiania chamaelea* (L).Mull.Arg. revealed that, the powder was light brown in colour and fibrous in nature with a characteristic odour, bitter, astringent and sour tastes. The microscopical evaluation of powder showed the presence of acicular and cluster crystals of calcium oxalate, sectional view of cork cells, epidermal cells of leaf with stomata, epidermal cells of midrib, epidermal cells of petiole in surface view, pitted parenchyma, fibres, medullary rays, sclereids, stone cells, stomata, starch grains, spiral vessels, rosette crystals and parenchyma cells. The descriptions about the macroscopic and microscopic evaluation of the powder of whole plant *Sebastiania chamaelea* (L).Mull.Arg. was not available from the literature review.

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REFERENCES


