Pharmacognostical Studies on Aglaia Roxburghiana Miq. Var. Beddomei

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ABSTRACT: Morphological, anatomical, quantitative microscopy powder microscopy, physical constant preliminary phytochemical analysis and fluorescence analysis of the leaves of Aglaia roxburghiana Var. Beddome were carried out.

INTRODUCTION

The drug ‘Priyangu’ is classified in the Ayurvedic Materia Medica as an odoriferous material (Sugandha dravya) under Karpooradhi Varga¹ and is regarded sandigda to-day. According to the available literature and practice in India, Aglaia roxburghiana Nig. Var. Beddome is used in the drug Industry as ‘Priyangu,’²³.

A. roxburghiana Var. beddomei is a large tree, confined to the Western Peninsula. Leaves large, imparinnate (Fig.1), leaflets seven in number, oblongtolanceolate. Flowers dull yellow. Berries subglobose,densely covered with red-brown stellate scales.

The plant is considered as a remedy for dysentery, leucoderma, skin diseases, leprosy, excessive perspiration, high fever, thirst, tumours, urinary discharges and burning sensation of the body. It is also considered as a blood purifier. The leaves are emetic and stop abdominal pain³.

Present investigation deals with the pharmacognostic studies of the leaflets as a whole and its powdered form.

MATERIALS AND METHODS

The plant material was collected from Tirupathi Hills at 900 m above sea level of Andhra Pradesh. A voucher specimen herbarium (M-47) is kept in our Laboratory for future reference. Standard methods of microscopy were applied⁴. Quantitative microscopy were determined by methods prescribed by Wall⁵. Photomicrographs were taken at different magnifications depending upon anatomic details to be brought out. Physical constant⁸ Preliminary phytochemical tests⁹ were carried out. Fluorescece characters¹⁰ were also observed under ultra violet light at 254 nm.

T.S. OF PETIOLE

Transverse section of petiole is vertical elliptic and truncate on the adaxial side (Fig 2-A). Peltate scales are rare. Cortical region consists of 2 to 3 rows of chlorenchyma, 2 to 4 rows of collenchyma cells followed by 8-10 rows of parenchyma cells (Fig-20). The vascular cylinder is entire and 5 lobed with a
deep adaxial depression. Pericyclic fibres present. Pith is shows two prominent upper invasions. Pith is made up of rounded parenchyma cells and some of the cells contain calcium oxalate crystal.

**T.S. OF PETIOLULE**

Transverse section of petiolule is nearly circular in outline with an adaxial flat face (Fig. 2C). Many of the epidermal cells support peltate scales. The cortical region consists of 3-4 rows of collenchymas cells followed by 8-12 rows of parenchyma cells. Many of the parenchyma cells contain calcium oxalate crystals.

The vascular cylinder is arcuate. Pericyclic fibres present (Fig.2D). Several bunches of huge stone cells are present in the cortical parenchyma in a ring around the vasculature. Also present are 2 or 3 such aggregations in the medulla (Fig.2C). Some of the medullary parenchyma cells contain calcium oxalate crystals.

**T.S. OF RACHIS**

Transverse section of rachis is circular in outline (Fig.2E). Most of the epidermal cells support peltate scales. Cortical region consists of 4 to 5 rows of collenchymas cells followed by 15-20 cells deep parenchyma zone. Some of the parenchyma cells contain calcium oxalate crystals. Vascular cylinder is five angled. Vessels occur mostly solitary and are round to oval in outline. Bunches of huge stone cells are present in the cortical and pith region (Fig.2F). Pericyclic fibres present. The ground tissue consists of circular to oval parenchyma cells with intercellular spaces.

**T.S. OF LEAFLET**

The mature lamina is dorsiventral in structure (Fig.2G) with well differentiated mesophyll. At the midrib region, the thickness is about 810 - 860µm in thickness (Fig.2H). In the lamina the adaxial epidermal cells are rectangular in cross section, measuring up to 14 µm anticlinically and up to 28 µm periclinically. Subjacent to the epidermis is three layered palisade, the two upper layers made up of equally elongate cells and the third of shorter cells. Occurrence of large crystalliferous idioblasts with huge solitary calcium oxalate prism in each (Fig.2H & I) is a characteristic feature.

Secretary elements occur at the juncture of the palisade and spongy tissues (Fig.2H & I) and also among spongy tissues in horizontal series.

Below this palisade, 5-6 layered 110 – 120 µm deep spongy mesophyll tissues are seen. The spongy tissue is composed of nearly oval to rounded fairly closely arranged cells. The abaxial epidermis is made up of smaller cells and is liberally perforated by stomata.

The midrib of the leaflet projects strongly as a hemispherical structure on the abaxial side and on the adaxial side it is in the form of a small hump (Fig.2G). Collenchymas cells are situated just below the adaxial hump and above the abaxial epidermis. The palisad tissue reduced to one layer is continuous over the midvein.

A single cylindric vascular strand is situated in the center of the midrib.

**THE EPIDERMIIn SURFACE VIEW**

The adaxial epidermis is totally devoid of stomata, the abaxial epidermis shows abundant anamocytic stomata. The adaxial epidermis in surface view is made up of mostly pentagonal to hexagonal cells with
straight margins (Fig.3A). It is totally devoid of stomata.

The abaxial epidermal cells shows slightly wavy outline. The stomata which are abundant are of ranunculaceous (Anamocytic) type (Fig.3B). The subsidiary cells are oriented parallel to the margin of the stomatal apparatus.

**TRICHOME**

Unicellular trichomes occur very rarely, while characteristic peltate scales with 22-24 arms are numerous, measuring 2000 – 2250 (Fig.2J).

**QUANTITATIVE MICROSCOPY**

Palisade ratio : 3.75 to 5 (Fig. 3D)

Vein islet number : 6.8 (Fig. 3 E)

For lower epidermis

Stomatal number : 30-35-40/mm²

Stomatal index : 8.3-9.6-11.8/mm²

**POWDER MICROSCOPY**

Parenchyma cells single or in groups. Peltate scales with acute arms, stone cells, spiral tracheary elements, adaxial epiderma tissues are 5-6 angular and imperforate, the abaxial epidermal tissues are slightly wavy with anamocytic stomata, huge prismatic crystals and fibres present.

**MACERATION**

The vessels are medium sized. Perforations are simple. The fibres are long and measuring 650-725 x 12-14µm. Parenchyma cells are readily distinguishable besides the epidermis (Fig.3C).

The physical constant values are reported in Table I. Preliminary phytochemical analysis are presented in Table II. Fluorescence analysis of the various extracts of the leaf powder and drug powder was carried out and is presented in Table III & IV.

**DISCUSSION**

The present study covers the detailed pharmacognostical analysis of the leaves of *A.roxburghiana* Var. *beddomei* (Meliaceae). The presence of three layered palisade tissue, secretory elements in the spongy mesophyll, occurrence of large crystalliferous idioblasts with huge solitary calcium oxalate prism, ranunculaceous stomata and stellate trichomes in the leaf and the presence of bunches of huge stone cells in the cortical parenchyma of the petiole and petiolule are the salient features of diagnostic value in the pharmacognostic determination of the drug. The relevant Preliminary phytochemical studies, powder microscopy, fluorescence analysis, physico-chemical standards are very much helpful for laying down the standards.

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### TABLE – I
**PHYSICAL CONSTANTS**

| Ash content          | 10.85%   |
|----------------------|----------|
| Water soluble ash    | 2.33%    |
| Alkalinity of water soluble ash | 0.215 ml of 0.1 N HCl/gm |
| Acid insoluble ash   | 0.573%   |
| Extractive value     |          |
| a. Hexane            | 6.07%    |
| b. Benzene           | 1.40%    |
| c. Chloroform        | 0.93%    |
| Solubility           |          |
| a. Alcohol           | 15.26    |
| b. Water             | 12.03    |
| Moisture content at 110°C | 9.98    |
| Qualitative analysis | Inorganic Carbonate, Chloride, Sulphate, Iron, Calcium and Magnesium |

### TABLE – II
**PRELIMINARY PHYTOCHEMICAL ANALYSIS**

| Test       | Hexane | Benzene | Chloroform | Alcohol |
|------------|--------|---------|------------|---------|
| Coumarin   | +      | +       | +          | +       |
| Quinone    | -      | +       | +          | +       |
| Furan      | -      | -       | -          | -       |
| Phenol     | -      | -       | +          | +       |
| Sugar      | -      | -       | -          | +       |
| Steroid    | +      | +       | +          | +       |
| Tannin     | -      | -       | -          | +       |
| Triterpene | +      | +       | +          | +       |
| Alkaloid   | -      | -       | +          | +       |
| Flavonoid  | -      | -       | -          | -       |
| Acid       | -      | -       | +          | +       |
| Saponin    | -      | -       | -          | -       |

### TABLE – III
**FLUORESCENCE ANALYSIS OF LEAF EXTRACTS**

|          | Day light   | UV light |
|----------|-------------|----------|
| Hexane   | Greenish yellow | Green    |
| Benzene  | Greenish yellow | Green    |
| Chloroform | Greenish yellow | Green    |
| Alcohol  | Greenish yellow | Green    |
| Water    | Pale yellow  | Green    |
| Acetone  | Green       | Green    |
TABLE – IV

FLUORESCENCE ANALYSIS OF LEAF POWDER

| Drug powder                  | Day light | UV light |
|------------------------------|----------|----------|
| Drug powder                  | Pale green | Green |
| Drug powder & In NaOH (aqueous) | Red | Dark green |
| Drug powder & In NaOH (alcohol) | Green | Green |
| Drug powder & HCl            | Pale red | Green |
| Drug powder & 50% H2SO4      | Pale red | Green |

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Fig. 1 : Aglaia roxburghiana Miq. Var Beddomii – A Twig.
Fig 2A : T. S. of petiole (Scale – J)
Fig 2B : T. S. of petiole – A portion enlarged (Scale – H)
Fig 2C : T. S. of petiolule (Scale – J)
Fig 2D : T. S. of petiolule – A portion enlarged (Scale – I)
Fig 2E : T.S. of rachis (Scale – J)
Fig 2F : T.S. of rachis – A portion enlarged (Scale – VI)
Fig 2G : T.S. of leaflet – (Scale – J)
Fig. 2H : T.S. of Lamina – (Scale – G)
Fig. 2I : T. S. of Lamina – (Scale – F)
Fig 2J : T.S. of Trichome (Scale – F)
Fig. 3A : Adaxial epidermis in surface view (Scale – F)
Fig. 3B : Abaxial epidermis in surface view (Scale – F)
Fig. 3C : Maceration (Scale – H)
Fig. 3D : Palisade ratio (Scale F)
Fig. 3E : Vein islets (Scale – J)
Fig. 3F-J : Scales applicable to Microphotographs
Ch : Chlorenchyma; Co-Collenchyma; Cr. – Crystal;
EP : Epidermis; F-Fibre; Pa-Parenchyma;
PF : Phloem Fibre; Pal-Palisade Tissue; ph – phloem;
PS : Peltate scale; S-Strong, Sc – Stone cell;
SE : Secretory cell; Sp – Spongy tissue; V-Vessel
VC : Vascular cylinder; Vi-Vein islet; Vs – Vascular strand;
Xy : Xylem.