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PHARMACOGNOSTIC AND PHYTOCHEMICAL INVESTIGATION ON STEM BARK OF *CHLOROXYLON SWIETENIA* DC. AN ETHNOMEDICINALLY IMPORTANT MEDICINAL TREE

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ABSTRACT: *Chloroxylon swietenia* DC. belongs to the family Rutaceae / Meliaceae / Chloroxylaceae, is a medicinal and aromatic tree of dry deciduous forests. It is popularly known as Yellow wood, East Indian satin wood and Ceylon satin wood. The stem bark is credited for its effectiveness in the treatment of common cough and cold, it is also used as an astringent. Its pharmacognostic data for authentication of the crude drug is not available, hence, in the present study, macroscopical, microscopical, and preliminary phytochemical investigations of stem bark is undertaken. Powder microscopy revealed that Cork cells, Calcium oxalate crystals, Phloem parenchyma, medullary rays and thick walled phloem fibers were abundant. Anatomical studies showed the presence of phellem, phellogen, and phelloderm with abundant secondary phloem. The qualitative chemical tests of petroleum ether, chloroform, acetone, ethanol and water extracts of stem bark revealed the presence of carbohydrates, alkaloids, glycosides, flavonoids, phenolic compounds and tannins.

INTRODUCTION: *Chloroxylon swietenia* DC. belonging to the family Rutaceae / Meliaceae / Chloroxylaceae, is a tropical aromatic tree of dry deciduous forests [1]. It is a moderate sized and deciduous tree of about 9-15 m in height and 1.0-1.2 m in girth with a spreading crown and clean bole up to 3 m. The tree is native to India and Sri Lanka and popularly known as Yellow wood, East Indian satin wood, Ceylon satin wood [2].

The whole part of this tree has long been used in the indigenous system of medicine such as the bark is used as an astringent [3, 4], leaves are applied to worm infested wound of animals, fungal infection of skin and for the treatment of inflammation related disorders like pain and rheumatism [3].

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Stem bark paste is used as an external application on wounds [3]. A decoction of the stem bark is astringent and used externally to treat contusions and painful joints; it is also given to treat chest pain among the tribal inhabitants of southern Bihar. Among the Gonds of Uttar Pradesh, a decoction of the stem bark, together with that of *Mangifera indica*, *Madhuca indica* and the leaves of *Holoptelea integrifolia* and *Dendrocalamus strictus* are used in bath to treat jaundice [4]. The wood is often golden in color with a reflective sheen and used in the manufacturing of wooden furnitures.

The wood is used in bridge construction, for ploughs, oil mills, pestles, in well constriction and in Madras for cart shafts, axles, naves, folloes and spokes. Being a highly figured wood, if cut on the quarter, it is prized for cabinet work, picture frames, furniture, carving, turnery and other fancy work [2, 3, 5].

Owing to its heavy demand, the tree now has become endangered. The tree has been cited under

Red List category under IUCN Red List of Threatened Species, as per the assessment of Asian Regional Workshop (Conservation and Sustainable Management of Trees, Viet Nam, August 1996) 1998 [6, 7].

However, no scientific data are available regarding pharmacognostic, phytochemical and anatomical studies on stem bark of *Chloroxylon swietenia* DC. Hence, the present investigation is undertaken to establish pharmacognostic profile which will help in identification of crude drug and to establish standards.

MATERIALS AND METHODS:

Plant material:

The stem bark of *Chloroxylon swietenia* DC. was collected from Karnatak University Campus Dharwad, Karnataka and subsequently identified by one of the authors Dr. M. Jayaraj. A voucher specimen has been deposited in the P. G. Department of Botany, Karnatak University, Dharwad for future reference.

Drying of plant material:

After authentication, the bark was removed and dried at room temperature until they were free from the moisture and then powdered with a mechanical grinder. The powder was passed through sieve and stored in a air tight container for further studies [8, 9, 10, 11].

Macroscopic and microscopic studies:

The macroscopy and microscopy of the stem bark studied according to the method [12, 13]. Sections of the stem bark were prepared and stained with haematoxylin and erythrosin B stains as per the procedure [14]. Powder microscopy is performed according to the prescribed procedure [12, 13, 14]. Photomicrography of the selected sections were taken using Axio star plus (Carl zeiss) Bright field /fluorescent modular microscope and Cannon's power shot G2 digital camera with required magnifications.

Fluorescence analysis:

A small quantity of dried and finely powdered stem bark was placed on clean microscopic slide and added 1-2 drops of the freshly prepared reagent solution mixed by gentle tilting the slide and allowed for 1-2 minutes. The colors observed by application of different chemical reagents in different radiations were recorded [15, 16].

Preliminary phytochemical screening:

Dried, coarsely powdered stem bark was extracted successively with petroleum ether, chloroform, acetone, ethanol and water using Soxhlet apparatus [17, 18]. All the extracts were screened for the presence of phytoconstituents. Preliminary phytochemical tests for various extracts were carried out according to the standard procedures [19, 20].

RESULTS AND DISCUSSION:

Macroscopic studies:

Stem bark is 0.5 to 1.0 cm thick, curved, cracked, uneven. Outer surface is yellowish green, whereas inner surface is creamish yellow in color **(Plate 1)**, with characteristic odour and very light in weight. Taste is bitter and pungent.

TABLE: 1 ORGANOLEPTIC CHARACTERS OF STEM BARK POWDER

Color	Odour	Taste	Touch
Yellowish green.	Characteristic.	Bitter and pungent.	Fibrous, smooth.

Microscopic studies:

Manual sections of both transverse and longitudinal sections of stem bark were taken and stained **(Plate 2** and **3)**. The sectional view of stem bark shows distinct layers such as Phellem, Phellogen and Phelloderm.

Phellem (cork) is the outer most layer, which consists of 12-16 layers of cells. The cells are irregular in shape, arranged in vertical rows, walls are slightly thick and content scanty **(Plate 2)**. In transverse section phellogen (cork cambium) appears as a continuous Tangential layer of rectangular, radially flattened cells of 3-4 layers. They are compactly arranged without having intercellular spaces. In longitudinal section also phellogen cells are rectangular in shape **(Plate 2)**. Phelloderm is broad and prominent. Cells are living, more or less isodiametric in shape. Number of brachysclereids (stone cells) are embedded in this region **(Plate 2)**. Extended part of this region forms the secondary cortex **(Plate 2** and **3A)** with 10-15 layers of parenchyma cells and lignified

Pericyclic fibers are embedded in it **(Plate 3)**. Rest of the section is made of secondary phloem. Secondary phloem is abundant with phloem parenchyma, phloem fibers, medullary rays, sieve tubes **(Plate 2, Plate 3B** and **3C)**. Phloem fibers predominant, in groups of 20-25 in each group **(Plate 3B)**. Medullary rays are uni or biseriate, cells rectangular, radially long, walls thin with dense content **(Plate2 and 3B)**.

Powder microscopy:

Powder microscopic analysis was carried out with small amount of stem bark powder, which was mixed with phloroglucinol: HCl (1:1) and then placed on microscopic slides. The slides are mounted in the glycerin and are observed under light microscope. The cork cells observed as compact mass of cells in surface view. The cells are hexagonal and polygonal in shape **(Plate 4a).** The fibers are observed to compose of elongated cells with pointed ends and thick walls **(Plate 4b** and **c)**. The calcium oxalate crystals are observed as shining prism crystals **(Plate 4d)**. Ray initials are observed, which are surrounded by sieve tube and parenchyma strand **(Plate 4 e)**. The structural elements of phloem, which include, sieve tube, companion cells, phloem parenchyma and phloem fibers are observed. The cells are elongated and are arranged in linear shape **(Plate 4 f)**.

Preliminary phytochemical screening:

The extracts were subjected to preliminary phytochemical tests to detect the presence and absence of various phytoconstituents. Preliminary phytochemical screening of the *Chloroxylon swietenia* DC. Stem bark powder is done following standard method [21] and the results are presented in **Table 2**. Phytochemical test shows the presence of carbohydrates in chloroform and water extract. Phenolic compounds and tannins showed only in water extract. Alkaloids observed in chloroform, acetone, ethanol and water extract, whereas glycosides and flavonoids were observed in ethanol extract **(Table 2)**.

Fluorescence analysis: The fluorescence characteristics of stem bark powder with different chemical reagents are summarized in **Table 3**.

TABLE 2: PHYTOCHEMICAL ANALYSIS OF STEM BARK OF *CHLOROXYLON SWIETENIA* DC.

Plant constituents	Test/Reagent Used	Name of Extract				
		Petroleum Ether Extract	Chloroform Extract	Acetone extract	Ethanol extract	Water extract
Carbohydrates	Benedict's test	-	-	-	-	+
	Molisch's test	-	-	-	-	-
	Fehling's test	-	+	-	-	-
Phenolic compounds and Tannins	Ferric chloride test	-	-	-	-	-
	Gelatin test	-	-	-	-	-
	Dilute HNO3	-	-	-	-	+
Alkaloids	Mayer's test	-	+	+	+	+
Glycosides	Molisch's test	-	+	-	+	-
Flavonoids	Shinoda's test	-	-	-	+	-

TABLE 3: FLUORESCENCE ANALYSIS OF STEM BARK OF *CHLOROXYLON SWIETENIA* DC.

Treatment	Visible/Day light	UV light
Powder(P) as such	Yellowish green	Light green
P+ phlouroglucinol : HCl (1:1)	Bottle brown	Black
P+ methanol	Yellowish green	Light green
P+ 50% H_2SO_4	Light green	Green
P+ 50% HNO_3	Saffron	Light green
P+ 50% HCl	Yellowish green	Light green
P+ 10% NaOH	Dark saffron	Green
P+ ammonia	Dark saffron	Green
P+ glacial acetic acid	Dark yellow	Light green
P+ 1% Picric acid	Yellow	Yellow
P+ 5% FeCl3	Black	Black
P+ 10% potassium dichromate	Dark saffron	Green

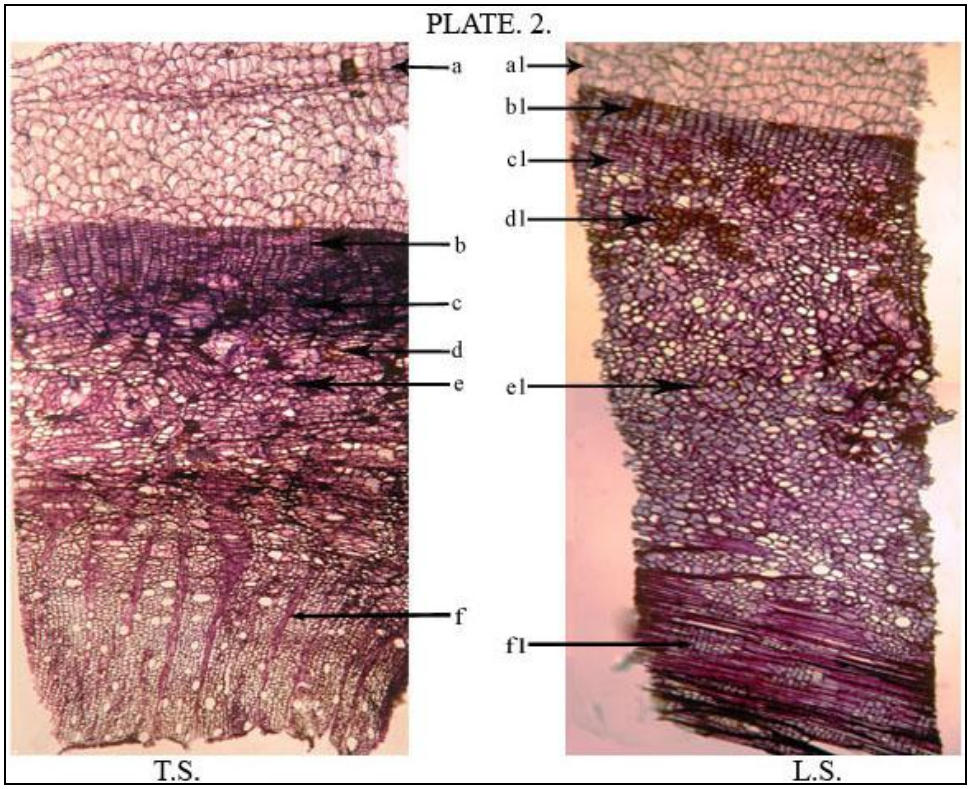
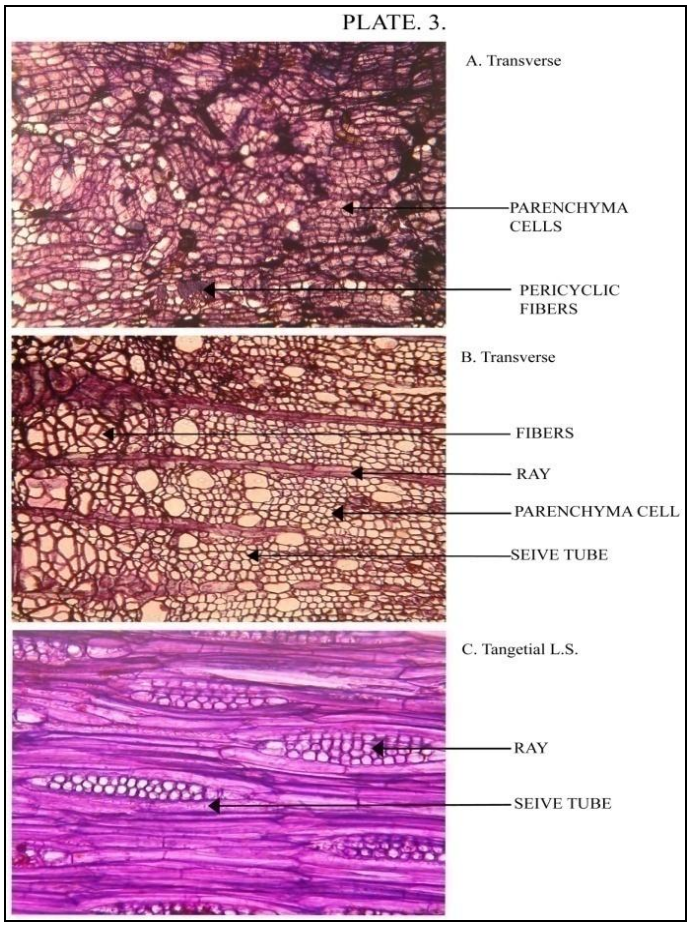


PLATE 2: a, a1: PHELLEM; b, b1: PHELLOGEN; c, c1: PHELLODERM; d, d1: BRACHYSCLEREIDS; e, e1: SECONDARY CORTEX; f, f1: MEDULLARY RAYS.



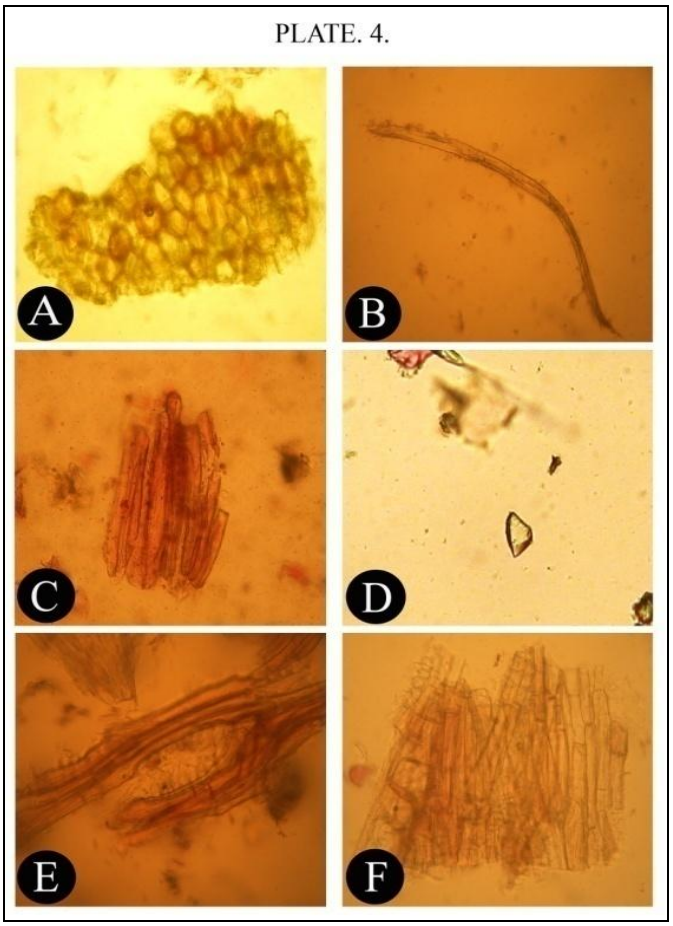


PLATE 4: A: CORK CELLS, B: SINGLE FIBER, C: FRAGMENTS OF FIBER IN GROUPS, D: CALCIUM OXALATE CRYSTAL, E: MEDULLARY RAY WITH PARENCHYMA, F: PHLOEM PARENCHYMA.

CONCLUSION: The present study provides in-depth macroscopical, microscopical features and showed presence of Carbohydrates, phenolic compounds, tannins, alkaloids, glycosides and flavonoids. It also provides pharmacognostic data, which could be used for determining correct identity and purity of stem bark and for the detection of adulteration.

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