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**PHARMACOGNOSTICAL INVESTIGATION AND PHYSICOCHEMICAL ANALYSIS OF
CLERODENDRUMINDICUMLINN.LEAVES**

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Abstract

*Clerodendrumindicum*Linn.is an important medicinal plant and widely used in the treatment of variety of diseases and well explored scientifically for their pharmacological properties. The current study was therefore carried out to provide requisite pharmacognostical and physicochemical details of the leaves by means of standardization of the species. The morphological study reveals the leaves are obovate-oblanceolate or elliptic– lanceolate with serrate-dentate margins acute apex and cuneate base. The microscopy reveals the dorsiventral type of leaf, with anomocytic stomata covering lower epidermis and presence of oil glands were also found. Calcium-oxalate crystals were found within the ground tissue. In the midrib section centrally hollow pith was found, which is surrounded with sclerenchymatous sheath. Physicochemical properties such as ash value and extractive values were established. Qualitative phytochemical screenings revealed the presence of alkaloids, steroids, terpenoids, glycosides, tannins and carbohydrates. The results of the study could be useful in setting some diagnostic indices for the identification and preparation of a monograph of the plant.

Keywords:*Clerodendrumindicum*Linn.,Leaves, Pharmacognosy, Physicochemical.

Introduction:

Indian sub-continent is endowed with numerous flora and fauna, which are used for the treatment of various ailments because of their medicinal properties. In spite of spectacular advancements in modern medicine, sizable rural populations of India depend and rely on traditional medicines made from plants and animals. Last decade mark the uprising of branch as the quest for biologically active compounds from natural source had increased its pace. Higher

plants have played a vital role as a source of therapeutic agents. However, it is also become very necessary to maintain the standards of these naturals. To maintain the standards the primary pharmacognostical and physicochemical parameters have been playing a vital role to achieve the authentic variety and to getdesired therapeutic value from it.

*Clerodendrumindicum*Linn., (family: Verbenaceae) is a perennial bushy plant that attains a height of 2-8 feet in height. Stem is hollow. Leaves are rough having dentate at the edges, spear shaped. The inflorescence is large and bears tubular flowers that bear white or bluish colored flowers and it is about 2 feet in length and one inch broad. These flowers have good odour. Fruit is circular, pulpy and when it ripe, it changes to dark purple to black in colour. However, detail standardization study of *Clerodendrumindicum*Linn.have not been done yet; so, the present study has been designed to study the pharmacognosticaland physicochemical features of the leaves of the plant.

It is generally found in the area that is about 4000 feet in height. It is more commonly found in areas with moderate temperature.In India it is found in the eastern region of Himalaya like Nepal, Kumaun, Bengal, Bihar and regions of Bihar. In Ayurveda it is named as ‘Bhargi’, in Bengali it is commonly known as ‘Bamanhati’, in English ‘skyrocket’.

Bhrangi along with zinger powder is a popular prescription quoted by several ayurvedic texts in the management of shwasa(Asthma). The plant extract has been employed as a vermifuge and febrifuge¹.The root and leaf extract of *Clerodendrumindicum*Linn.has been shown positive result in rheumatism, asthma and other inflammatory diseases².Moreover, the juice of leaves has wider applications in hepatic eruptions and pemhigus³. The methanolic extract of the plant has been shown to inhibit lipid peroxidation in bovine brain⁴. The stem and root of the plant contain two flavoidalcompounds such as pectolinarigenin and hispidulin.

Folklore claims for the abortificient action of its bark and root especially in Bengal, Bihar and Orissa region⁵.Traditionally its leaf is used as anthelmintic in Uttarpradesh⁶. The leaves are also used as an edible vegetable by the tribes of Arunachal, Assam, Meghalaya, Manipur, Nagaland, Mizoram and Tripura region⁷.

Materials and Method:

➤ **Identification of the plant:**

Clerodendrumindicum Linn. (*Bhargi*) was taxonomically identified at the Central National Herbarium, Botanical Survey Of India, Howrah, West Bengal, India. The authentication number is CNH/117/2011/Tech.II/653.

➤ **Collection of plant:**

The mature leaves required for the present study was collected from Halisahar, North 24 Parganas, West Bengal, India. From the collected leaves, few samples of leaves were separated for the study of macroscopical & microscopical characters. The rest of the leaves were washed with water for removal of physical impurities and then shade dried to crush.

➤ **Pharmacognostic study:**

A. Macroscopic Characters:

Macroscopic characters of the leaves were studied systematically like size, shape, color, odour, taste and texture; the length, breadth etc. measurements are measured by standard scale⁸.

B. Microscopic Characters:

Free hand sections of fresh leaves were performed and observed under microscope. The microscopical features were noted down, for histochemical analysis of the sections various stains like phloroglucinol and concentrated hydrochloric acid, Sudan red III indicators, starch solution etc. were used⁸.

➤ **Physicochemical analysis:**

A. Physicochemical analysis:

The dried leaf powder material was used for the determination of ash values, extractive values, and preliminary phytochemical investigation. The chemomicroscopic examination and behavior of powder with chemical reagents were also studied. Chemical constituents of the samples were broadly determined by qualitative tests, using their extracts. For qualitative tests petroleum-ether, chloroform and ethanol extracts were used and the phytochemical screenings were performed to seek the presence of various secondary metabolites within the respective extracts. Tests were performed like, for alkaloid- Mayer's test, steroid- Salkowski test, terpenoid- Libermann-Burchard test, glycoside- Brontegar's test, tannins- Ferric chloride test and carbohydrate- Molish's test etc.⁹

Results and Discussion:

➤ **Pharmacognostical investigation:**

A. Macroscopy: The shape of the leaf is obovate-oblongate or elliptic- lanceolate with serrate-dentate margins acute apex and cuneate base. The length of the leaf lamina is 14-15 cm and the breadth of the leaf lamina is 2.8-3cm.

The length of the petiole is 1.8-2 cm. The upper surface is smooth and the lower surface is slightly rough (Fig 1 & Fig 2).

Figures:



Fig 1: Upper surface of Leaf lamina



Fig 2: Lower surface of leaf lamina

B. Microscopy:

Microscopical investigation explores the anatomical features of the leaves; it includes: Lignified epidermal abaxial surface (Fig 3), 1-2 layers of elongated and compact palisade cells below the single layered epidermal cell of adaxial surface, it confirms the dorsiventral type of leaf (Fig 4). Below the palisade cell layer spongy parenchyma cell layers are loosely arranged with intercellular spaces (Fig 5). Presence of oil globules were found within the palisade cell layer (Fig 6). Anomocytic stomata were found and presence of starch grains within the guard cell was also found after stained with iodine solution, they were in abundance on the lower epidermis while upper epidermis showed comparatively less (Fig 7). The upper epidermal cells are comparatively larger than lower one, while the lower epidermis have a thick cuticle compare to upper epidermis. Presence of oil glands was found in the lower epidermis (Fig 8). Calcium-oxalate crystals were found within the ground tissue (Fig 9). In the midrib section centrally hollow pith was found, around the pith sclerenchymatous sheath was present; which separates the pith region from the vascular bundle region (Fig 10). Endarch type of vascular bundle arrangement was found and they are covered by phloem from both upper and lower side (Fig 11). Presence of Vascular bundles were also found within the petiole in a heart shaped ring arrangement (Fig 12).



Fig 3: Lignified epidermal abaxial surface

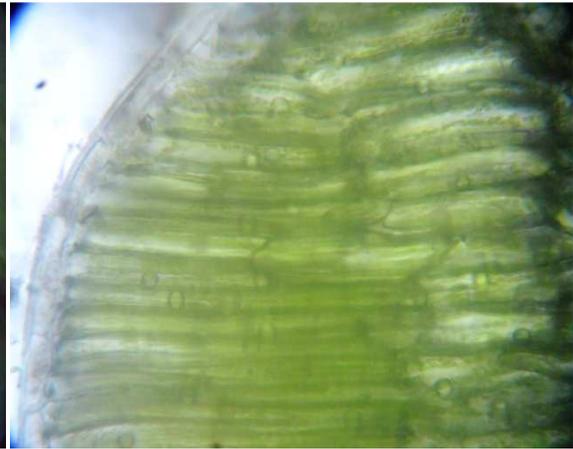


Fig 4: Layers of elongated and compact palisade cells

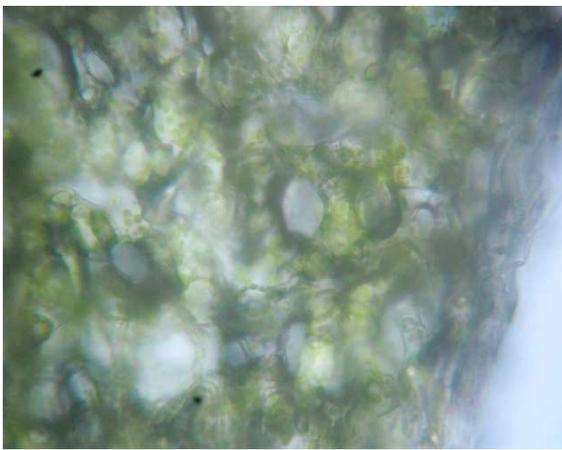


Fig 5: Spongy parenchyma cell layers

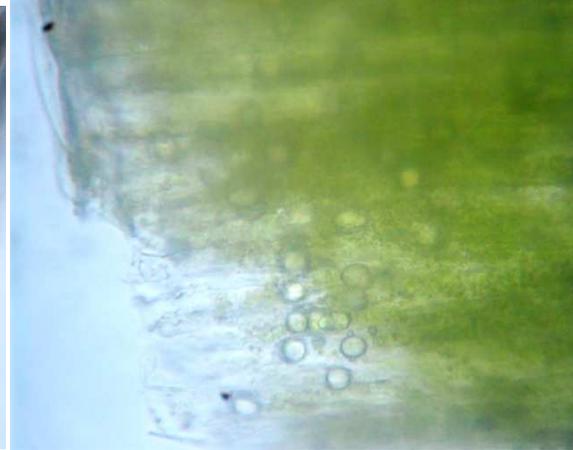


Fig 6: Oil globules in the palisade cell layer

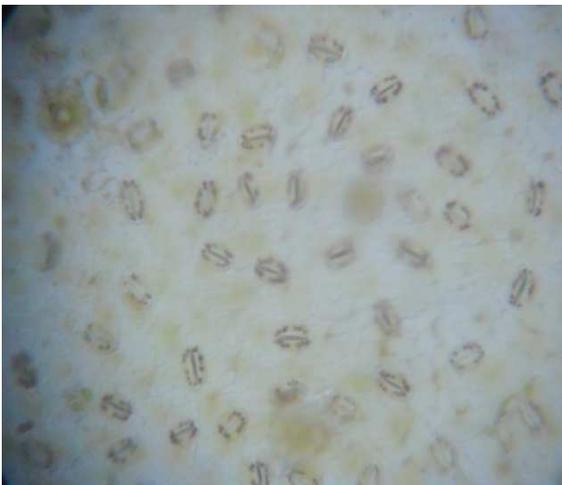


Fig 7: Anomocytic stomata

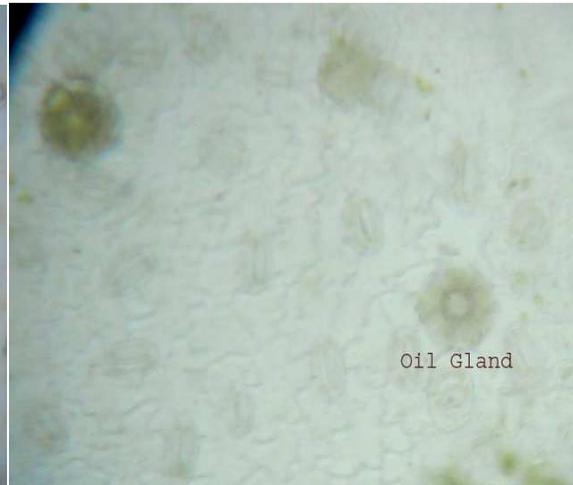


Fig 8: oil glands in the lower epidermis
& starch grains within the guard cell

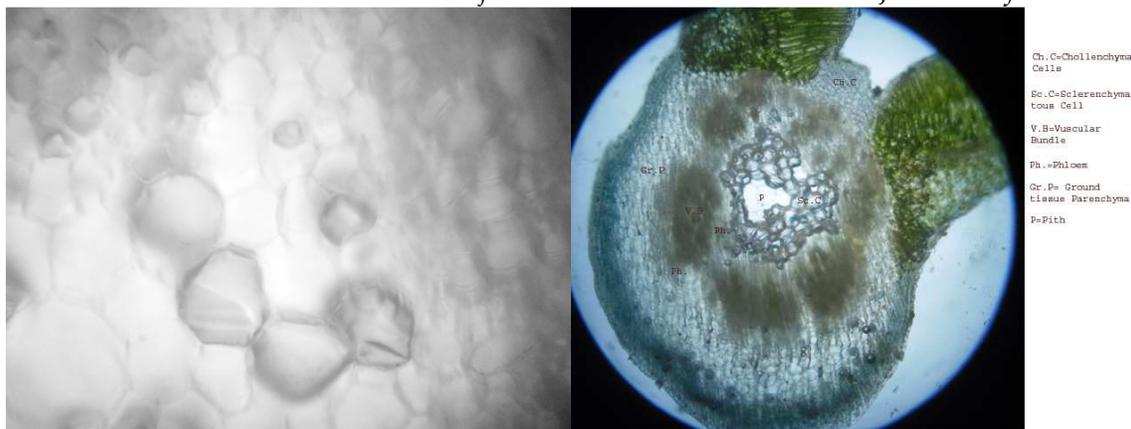


Fig 9: Crystals found in the ground tissue Fig 10: T.S of Midrib



Fig 11: Vascular bundles Projection

Fig 12: T.S. of Petiole

Organoleptic studies of the powdered leaf drugs were performed. Deep green coloured powder with characteristic odour appears; astringent is taste and smooth texture. Results are represented concisely in table 1. Histochemical studies of the powdered drugs expressed the presence of lignin, starch in the leaf. Negative result for fixed oil was found. The results are represented in table 2.

Table- 1: Organoleptic Characters of the leaves of *Clerodendrum indicum* Linn.

Diagnostic feature	Bhargi leaves
Colour	Dark green
Taste	Bitter, Astringent
Odour	Characteristic
Touch	Smooth
Texture	Amorphous

Table-2: Result of Histochemical tests of the Leaves of *Clerodendrumindicum* Linn.

Sr. No.		Tests	Results
1.	Test for Lignin	FeCl ₃ test	+
2.	Test for Starch	Iodine solution test	+
3.	Test for fixed oil	Sudan Red III test	-

+ =Present, - =Absent

➤ **Phytochemical Study:**

Physicochemical analysis of the leaves determines the total ash value was 8.72%w/w, indicates the presence of inorganic content in it. The Alcohol soluble extractive value (22% w/w) was comparatively higher than the Chloroform soluble extractive value that is 16% w/w and Ether soluble extractive value was found to be 2% w/w. So, it was found that the solubility of sample drug in alcohol was higher than the other solvents. The pH of the sample was found to be 4.5 in petroleum ether extract, 6.5 in case of chloroform extract and 5.7 in case of ethanol soluble extract. The variation in pH expresses the nature of extract and what kind of metabolites present in it. It sometimes interprets with the solvent effect also.

The physicochemical standards are important to check the quality, purity and adulteration of given crude drug. The different types of ash and extractive values were determined and summarized in table 3. Furthermore the phytochemical analysis of extracts of leaves showed the medicinal potential constituents includes, carbohydrates, tannins, flavonoids, steroids and triterpenoids. Phytochemical screenings were done and it indicates the presence of steroid and terpenoid in very intense amount in petroleum-ether and chloroform extract respectively. The ethanol extract shows the presence of alkaloid (slightly), steroid, terpenoid, glycoside, tannins and carbohydrate. The result of the study is represented in table 4.

Table -3: Physicochemical analysis of *Clerodendrumindicum* Linn. leaves.

Types of extractive value/Ash value	% w/w
Ash Value	8.72 %
Acid insoluble ash	2.75 %
Water soluble ash	3.89 %
Sulphated ash	6.14 %

Petroleum ether extractive value	2 %
Chloroform extractive value	16 %
Ethanol extractive value	22 %

Table -4: Result of the qualitative test of the sample *Clerodendrumindicum*Linn.

Sl.No.	Parameters	Results		
		Pet.ether extract	Chloroform extract	Ethanol Extract
1	Alkaloids	absent	absent	present slightly
2	Steroids	present	absent	Present
3	Terpenoids	absent	present	Present
4	Glycosides	absent	absent	Present
5	Tannins	absent	absent	Present
6	Proteins	absent	absent	absent
7	Phenolic compounds	absent	absent	absent
8	Carbohydrates	absent	absent	present
9	Saponins	absent	absent	absent
10	Fixed oil	absent	absent	absent

Conclusion:

The above study results may be concluded shortly as the leaf of *Clerodendrumindicum* Linn.is morphologically obovate-oblongate or elliptic– lanceolate with serrate-dentate margins acute apex and cuneate base. Micro-morphological study explores the characteristic features of this variety like lignified epidermal cell layer of abaxial surface, anomocytic type of stomata, guard cell enriched with starch grains, presence of calcium oxalate crystals within the ground tissue. The presence of oil globules within palisade cell layer may be concluded as the volatile oil because

the histochemical test for fixed oil produces negative result. Preliminary phytochemical analysis indicated presence of carbohydrates, fixed oil, glycosides, coumarins, tannins, flavonoids, saponins, steroids and triterpenoids. The information obtained from the preliminary phytochemical screening will be helpful in finding out the genuity of the drug. The ash values of a drug give an idea of the earthy matter or inorganic composition and other impurities present along with the drug. Extractive values are preliminary useful for determination of exhausted or adulterated drug. Thus ash, extractive values etc. physicochemical analysis will be helpful in identification and authentication of plant material¹⁰.

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