Eurasian Journal of Analytical Chemistry
ISSN: 1306-3057 OPEN ACCESS 2024 19 (1): 260-266
DOI: https://doi.org/10.53555/ejac.v19i1.1091

Determination of Physicochemical Parameters, Microscopy and Morphological Study of Medicinal Plant- *Acalypha indica*

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ABSTRACT
The Euphorbiaceae family, which is considered one of the largest families of Angiosperms, covers about 7,800 species distributed in approximately 300 genera and 5 subfamilies worldwide. These species occur preferentially in tropical and subtropical environments.
Acalypha indica belonging to the family Euphorbiaceae commonly known as haritha manjari, and Khokhali is an erect annual herb with stem dark green, quadrangular and longitudinal furrows and wings. It is used as expectorant, purgative, emetic, gastrointestinal irritant, diuretic, cathartic and anthelmintic. It is also used in constipation, skin diseases, ulcers bronchitis, and Cardiac diseases. The plant was found to contain secondary metabolites like, alkaloids, flavonoids, glycosides, lactones, terpenoids, cyanogenetic glucosides and glucosinolates, phenantherenes, quinines, phenolic acids etc.
The present study was carried out to investigate Powdered drug stem part of plant of *Acalypha indica* was used for the determination of various physiochemical parameters such as foreign matter, loss on drying, total ash value, water soluble ash value, and acid insoluble ash value and heavy metals analysis, Morphological and Microscopical Evaluation are important tool for the identification and purity of this plant. Moreover, the parameters estimated in the present study will also aid in maintaining the genuine nature of this plant thereby help in preventing the possible steps of adulteration/substitution with other *Acalypha* species.

KEY WORDS- Species, Microscopical, Morphology, Adulteration, Substitution, Inflammation etc.

INTRODUCTION-

Herbal medicines have been playing a vital role in treatment and cure for various diseases and physiological conditions in traditional methods practiced such as Ayurveda, Unani and Siddha. This type of treatment, also known as conventional treatment, was the main source of medical treatment during this time[1]. Acalypha indica is an herbal plant that grows in wet, temperate and tropical region, primarily along the earth's equator line[2]. This plant is considered by most people as a weed and can easily be found in these regions. Acalypha indica has been acknowledged by local people as a useful source of medicine for several therapeutic treatments. They consume parts of the plant for many therapeutics purposes such as anthelmintic, anti-ulcer, bronchitis, asthma, wound healing, anti-bacterial and other applications[3].

Classification
Kingdom : *Plantae*
Division : *Magnoliophyta*
Class : *Magnoliopsida*
Order : *Euphorbiales*
Family : *Euphobiaceae*
Genus : *Acalypha*
Species : *indica*[4]

Vernacular names
Sanskrit : Arittamanjarie.
English : Indian Acalypha.
Hindi : Kuppu; Khokali.
Telugu : Kuppichettu , Harita-manjiri;
Kuppinta or Muripindi

Vernacular names in other countries
Alcalifa : Brazil
Tie Xian : China
Baro , Berbere : Ethopia
Kuppimeni : India
Ricinela : Spain
Kuppameniya : Sri Lanka[5]

Acalypha indica occurs widely throughout the tropics of the Old World. In India it grows in sandy clay soil along road side, wide areas, and paddy easily available in Rajasthan, in Africa it occurs in Nigeria in West Africa and further widely throughout tropical Africa and the Indian Ocean islands. It also occurs in India, South East Asia, and Oceania. It has been introduced to areas of the new world with favorable climates. *A. indica* is an erect, simple or branched, slightly hairy annual herb growing to a height of 40-80 cm. The Plant contains secondary metabolites are alkaloids, saponins, steroids, flavonoids, tannins, terpenoids and phenolic compounds etc[6].

FOKLORE USES:

The plant leaf pastes with lime juice and powder of dry leaves, Decoction with garlic is having the Anthelmintic property, Decoction of the leaves taken 50ml per day, for 1 week by mouth cures the Asthma , Leaf juice, Paste is prepared by using leaves and black Cuminum then applied as a balm is used as the, Dermatology ailment[7]. Leaf ground into a paste and made into a ball-shape. The paste is introduced into the rectum to relax the sphincter and produces relief motions Leaves, roots and seeds are used as the Diarrhoea, Leaves ground with garlic, pepper and leaves of Leucas aspera, extract given orally and leaves mixed Cardiospermum halicacabum and boiled in Azadirachta indica oil. Extract is consumed is used for the Epilepsy Whole part plant is used as Expectorant, Crushing leaves and leaf decoction cures the haemorrhoids[8].

Fig- 1 *Acaylpha indica* Plant

MATERIALS AND METHODS

Plant material- The plants were collected from tropical and desert areas of Rajasthan Plant was identified and authenticated at Botany Department of the Apex University, Jaipur.

PHARMACOGNOSTICAL EVALUATION

Determination of physicochemical parameters-
Powdered drug stem part of plant of *Acalypha indica* was used for the determination of various physiochemical parameters such as foreign matter, loss on drying, total ash value, water soluble ash value, and acid insoluble ash value and heavy metals analysis. All these parameters are determined by following the standard method of Ayurvedic Pharmacopoeia of India[9].

Organoleptic properties of Crude Drug:-
Organoleptic characteristics- Color, odor, taste, were assessed for crude drug and extracts. For color, sample of raw material was placed in a glass petri dish and examined against a black and white background[10].

The morphological prominent fetchers like color, odor, taste, size, shape, apex, margin, base, venation pattern, petioles, surface including composition of the were studied and documented according to the standard Procedures. The Transverse section of stem was taken and developed with phloroglucinol and HCl. The powder drug studies are carried out with saffranin, sudan red, phloroglucinol and HCl, for different diagnostic characters. The Quantitative Microscopy and the other proximate values such as ash value, extractive values, and moisture content was carried out by standard method.

RESULTS

Morphological Evaluation-

Table- 1:- Morphological Study of *Acalypha indica*

Parameters	Observation
Odor	It has Characteristic and admissible odor
Color	Greenish
Size	Herb to 50(75) cm; branchless striate, thinly pubescent
Leaf	Leaves are dark green on dorsal side and light green on ventral side with smooth texture and serrate-crenate margin.
Stem	Cylindrical, Slightly flattened, Laterally branched, Nodes prominent and protruding internodes 3 to 4 cm in length and 2 to 4 cm in diameter, color outer pale brown
Root	Cylindrical, tortuous , varying in length 3 to 9 mm in diameter Outer color pale brown
Seeds	Pale-brown, ovoid, acute, smooth

Microscopical Evaluation-

- **Microscopical Study of *Acalypha indica***

Table- 2:- Transverse Section Studies of *Acalypha indica*

S. No.	Anatomical Characters	Observation
1.	**Leaf**	
	Epidermis	Upper and Lower Epidermis containing single layered cells covered with thick cutical.
	Parenchyma	Palisade Parenchyma is one layered, compa ct with radially elongated cells whereas spongy Parenchyma is many layered, loosely arranged with intercellular spaces.
	Collenchyma	The collenchyma consists of thick walled collenchymattous cells below the vascular bundle
	Trichomes	Trichomes are multicellular epidermal hairs present on upper epidermis (very rare) and lower epidermis (numerous).
2.	**Stem**	
	Epidermis	outer layer of epidermal cells embedded with globular masses of calcium oxalate crystals and stomata
	Parenchymatous cortex	parenchymatous cortex region showing clusters of prismatic crystals of calcium oxalate and starch grains
	Pith	Pith is wide and parenchymatous
	Xylem	Xylem fibers are well developed, brownish red in colour,
	Phloem	Phloem fibers are Thick walled, cellulosic in the inner part and ligniged in the outer part.
3.	**Root**	
	Cork	Outline shows outermost irregular running cork
	Phloem	Occupying almost major area of the section
	Cortex	Parenchymatous, Narrow, embedded with rosette, Cluster and prismatic crystal of calcium oxalate
	Xylem	Xylem is very wide shows isolated xylem vessels, xylem parenchyma are mostly vesicentric, medullary rays

		contain starch gain.

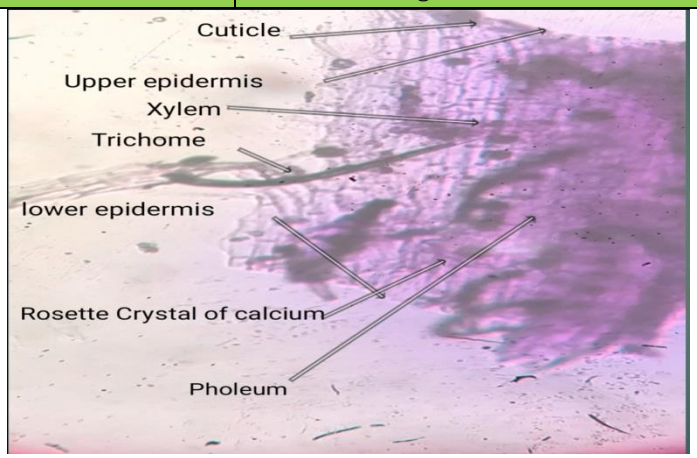


Fig-2 - T.S of *Acalypha indica* Leaf

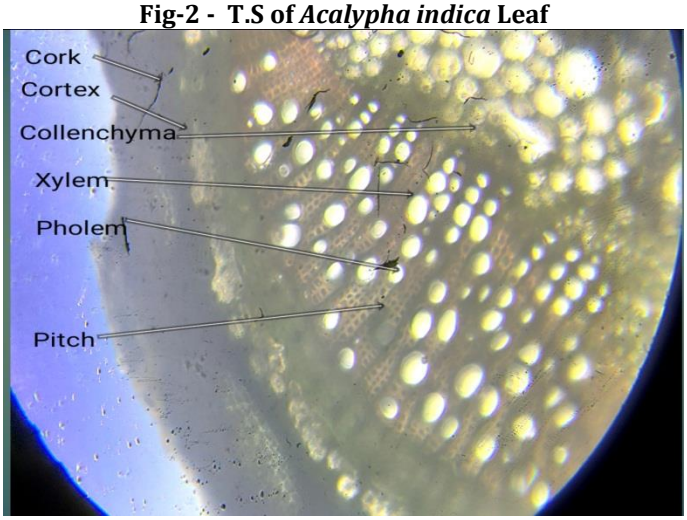


Fig-3- T.S of *Acalypha indica* Stem

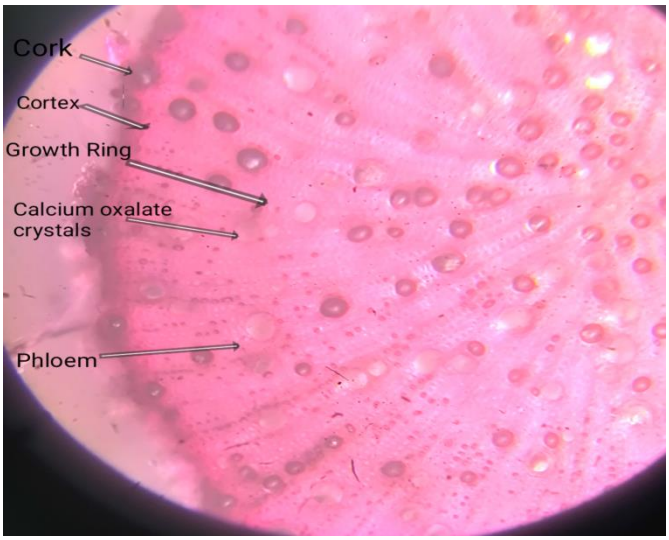
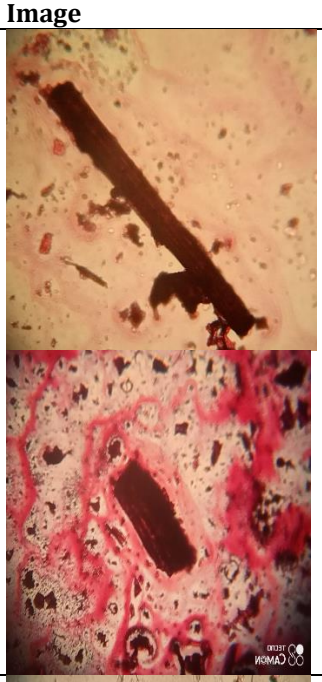
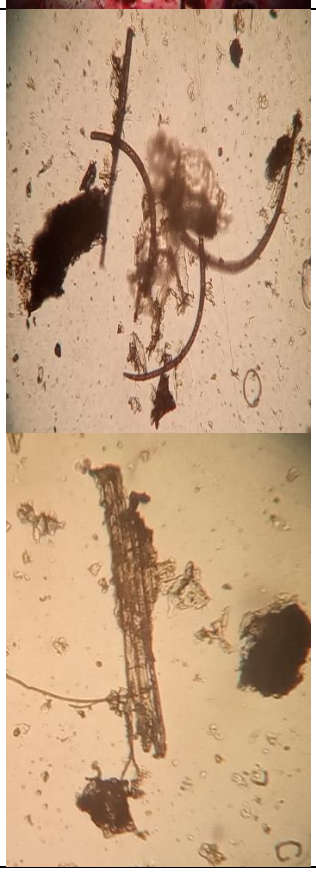


Fig-4- Transverse section of Root

Powder Microscopy - Crude Powder of stem part of plant- *Acalypha Indica*

Table- 3 – Result of Powder Microscopy of Stem *Acalypha Indica*

S. no.	Staining dye	Image	Character
1.	Safranine		Lignified cell clusters and lignified parenchyma
2.	Methylene blue		stained hairs, trichomes, and Parenchyma clusters

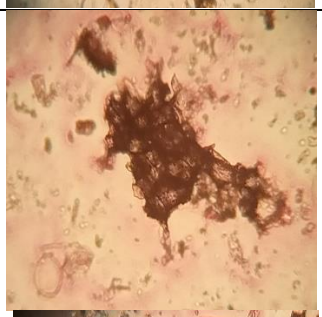
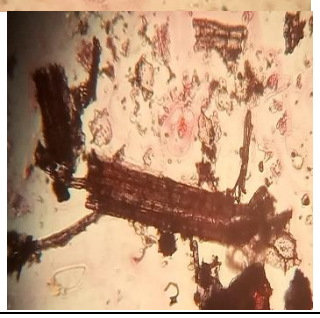
3.	Ferric chloride	 	Parenchymatous cell cluster, Polyphenol and tannins containing stained cells
4.	Eosine	 	Cell clusters and lignified Epidermis cells

Table- 4. Proximate Analysis of Stem of *Aclaypha Indica*

Physicochemical Parameters	Result
Organoleptic Properties	
Color	Greenish
Odor	Pungent
Taste	Bitter astringent
Foreign matter	Not more than 1%
LOD (%)	4.77%w/w
Ash Value	
Total ash (%)	7.13%w/w
Acid insoluble Ash (%)	0.53%w/w
Water Soluble Ash (%)	3.99%w/w
Heavy metals **Lead (Pb)** **Cadmium (Cd)** **Arsenic** **Mercury (Hg)**	 <0.1 PPM 0.22 PPM < 0.1 PPM < 0.1 PPM

DISCUSSION

Medicinal plants are widely distributed throughout the world but most abundantly in tropical countries. It is estimated that about 25% of all modern medicines are directly or indirectly derived from higher plants Thus, herbal medicine has led to the discovery of a number of new drugs, and non-drug substances[11]. According to WHO (World Health Organization), 80% of the world's population depends mainly on traditional medicines for primary health maintenance[12].

Euphorbia genus (Euphorbiaceae family), which is the third largest genus of angiosperm plants comprising ca. 2000 recognized species, is used all over the world in traditional medicine, especially in the traditional Chinese medicine. Different plants of Euphorbiaceae are used in traditional medicine[13]

Pharmacognostical evaluation of the whole part of *Acalypha indica* revealed the presence of various important diagnostic characters of the family Euphorbiaceae – Leaf-Upper and Lower Epidermis containing single layered cells covered with thick cutical, Stem-outer layer of epidermal cells embedded with globular masses of calcium oxalate crystals and stomata[15], Presence of Lignified cell clusters and lignified parenchyma, stained hairs, trichomes, and Parenchyma clusters. The presence of such characters can serve as useful parameters for the identification of the drug on the basis of microscopic aspects[14]

CONCLUSION

In conclusion, the overall studies Physiochemical parameters, Morphological and Microscopical Evaluation are important tool for the identification and purity of this plant. Moreover, the parameters estimated in the present study will also aid in maintaining the genuine nature of this plant thereby help in preventing the possible steps of adulteration/substitution with other *Acalypha species*.

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