Decoding the Pharmacognostical Blueprint of *Abutilon indicum* Linn.: A Study of Roots and Leaves

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Abstract - Herbal medications are natural products, and their phyto-constituents change with time, geography, processing, and storage. Variations in a herb's gathering, processing, or storage may have an influence on its efficacy profile. Tradition may be utilized as a guide to quality standards since it contains past knowledge about the right gathering and application of most medicinal herbs. This study evaluates the pharmacognostic properties of root and leaf extracts of *Abutilon indicum*. Research indicates a lack of focus on establishing standardized limits for plant roots and leaves. Our goal is to determine WHO standard limits for macroscopic and microscopic studies, including LOD, ash values, and extractive values, to control the quality of crude drugs.

Keywords: *Abutilon indicum Linn.*, Taxonomic classification, Microscopic study, Physicochemical Investigation.

Introduction

Our pharmaceutical field's best buddy is nature. Natural medications work well and don't cause any negative side effects. Commonly known as *Abutilon indicum* (Linn.) sweet (Malvaceae), The perennial plant known as "Country Mallow" can grow up to three meters in height. *A. indicum* is a common weed in the hotter regions of India and the sub-Himalayan region. According to reports, *A. indicum* possesses antibacterial, hepato-protective, hypoglycemic, male contraceptive, and antidiarrheal properties[1]. *Abutilon indicum*'s leaves are cordate, ovate, acuminate, tothed, and occasionally subtrilobate. They may reach a maximum length of 12 cm, with petioles of 3.8 cm stipules with linear, sharp, deflexed pedicles that are 9 mm long and frequently 2.5–5 long auxiliary single jointed very close to the top 12.8 mm long calyx with oval, apisculate middle lobes.

With a diameter of 2.5 cm, the corolla opens in the evening. Long carpals, typically 15-20 with a distinguishing little sharp tip hairy and a final shiny dark brown seed that is thickly minutely scrobiculate, are characteristically hairy of the base filaments of the staminal tube. It's a somewhat common roadside plant that grows in hotter regions of India[2] with the capacity to produce a wide range of chemical components, including flavonoids, proteins, alkaloids, and steroids, glycosides, phytosterols, and phenolic compounds. Plants are a crucial and vital part of the prescription drug industry. These plants yield carbohydrates, amino acids, saponins, and glycosides[3] which are used to treat a variety of illness including bronchitis, jaundice, toothaches, piles, diabetes, fever, leprosy, cystitis, ulcers, gonorrhea, diarrhea, cough, urine production, and lung disease. They are also used to treat cough, pulmonary TB, mumps, high fever, deafness, and ringing in

the ears. In Ayurvedic formulations, the whole herb is used to cure menorrhea, diabetes and hemorrhoids. In rats, A. indicum leaf extracts have hypo-glycemic effects.

Taxonomic Classification[4]

Kingdom	: Plantae
Class	: Magnoliopsida
Order	: malvales
Family	: malvaceae
Genus	: *Abutilon*
Species	: *indicum*

Ayurvedic properties[5]

Rasa	: Madhura
Guna	: Snigdha
Veerya	: Sita
Vipaka	: Madhura
Karma	:Balya,Vatahara,Vrsya

Figure-1 *Abutilon indicum* Linn

Pharmacological Potential and Medicinal Use of *A. indicum*

The majority of medications or compounds with minor to considerable pharmacological activity against enormous creatures and illnesses come from plants. Table-1 shows the phytoconstituents and pharmacological action.

Traditionally, the plant is used in inflammation, piles, gonorrhea treatment and as an immune stimulant. Root and bark are used as aphrodisiac, anti-diabetic, nervine tonic, and diuretic. Seeds are used as aphrodisiac and in urinary disorders[6] along with other therapeutic applications. Ayurvedic Pharmacopoeia of India indicates the use of the root in gout, polyuria and haemorrhagic diseases.

Traditional Claims

Nearly every portion of Atibala has therapeutic value and has long been used to treat a range of illnesses. The plant's roots are used to treat urethritis, chest infections, and diuretics. The root infusion is recommended as a cooling remedy for fevers and is thought to be helpful in leprosy, strangury, and haematuria. The leaves have been shown to help with ulcers and to soothe sore areas of the body. The leaves' decoction is used internally to treat bladder irritation and to treat toothaches and sore gums. The bark has diuretic, astringent, alexeteric, febrifuge, and anthelmintic properties. The seeds are used to treat chronic cystitis, gleets, gonorrhea, piles, laxatives, and expectorants[7]. The herb has historically been used to treat inflammation, piles, gonorrhea, and as an immune booster. Bark and root are used as a diuretic, nervine tonic, anti-diabetic, and aphrodisiac. Seeds are used to treat urinary issues and as an aphrodisiac. The Ayurvedic Pharmacopoeia of India lists the root's usage in treating hemorrhagic disorders, polyuria, and gout in addition to other medicinal uses.

Material and Methods

Collection and Authentication of Plant material

For Root and Leaf of *Abutilon indicum* Linn. (FamilyMalvaceae), plants were collected in the month of September from village Shankerpur, Distt. Dehradun (Uttarakhand). It was authenticated by Botanical survey of India, Allahabad U.P., India.

Drying of Plant material

After being detached from the *Abutilon indicum* plant, the root and leaf sections were given a water wash. After 30 minutes in the sun, it was allowed to dry for 15 days at room temperature in the shade, coarsely ground and then sieved through a 60 screen to ensure uniform particle size.

Macroscopic study

Macroscopic features of the leaf and root were observed using both the unaided eye and a magnifying glass. We detected the root part's shape, size, colour, odour, taste, surface features, fractures, etc[8,9].

Microscopical study

a. **T.S. of the Leaf-** To completely remove the chlorophyll, the leaf fragments were cooked in a test tube with chloral hydrate for a number of minutes. Both the dorsal and ventral sides of the leaf could be inspected.

   A sharp blade was used to cut the leaf portion, including the midrib, to create a transverse slice. Safranin was then used to stain the lignified tissue red.

b. **T.S. of the Root-** The hard drug sample was softened by boiling the root portion, which had a diameter of 3 to 5 mm and a length of around 2.5 cm in water for a few minutes. At this point, fine sections were taken using the softened samples. A cylindrical section of the root was cut perpendicular to the long axis and along its radial plane to create transverse sections[10, 11].

Physicochemical Investigation

Loss on drying

The mass loss as a percentage of weight is known as loss on drying. Water and volatile materials in the crude medication are determined by drying loss. Crude drugs will inevitably include moisture, which needs to be removed as much as feasible. A tarred glass petridish with around 2g of precisely weighed powdered medication was taken. The powder was dispersed uniformly. The sample was dried for two hours at a temperature between 100 and 105^0C while the petridish remained open in a vacuum oven, until a consistent weight was noted. After cooling to room temperature in a desiccator, it was weighed and noted in %. The following formula was used to determine the drying loss.

% Alcohol soluble extractive value = 80 X (Wt. of residue)

Water soluble extractive value

The procedure as above was followed using chloroform water I.P. instead of alcohol.

% Loss on drying = Loss in weight of the sample/ Weight of the sample X 100

Determination of Ash values

Ash values are useful for assessing a crude drug's quality and purity, particularly when it is powdered. The goal of ashing vegetable medications is to eliminate any organic matter residue that may otherwise obstruct an analytical result.

i. **Total Ash value-** It is the entire quantity of material that is left over after ignition. This comprises "physiological ash," which comes from the actual plant tissue, and "nonphysiological ash," which is the leftover material. After placing the drug (about 2 grams) in a crucible and heating it to 60^0 Celsius for two hours, the total ash value was determined. The percentage yield of the ash value was then computed using the air-dried medication as a reference.

ii. **Acid-Insoluble Ash**- The residue left over after the remaining insoluble material is ignited and the complete ash is boiled with diluted hydrochloric acid. 25 milliliters of diluted hydrochloric acid were added to the ash and boiled for five to ten minutes. The insoluble material was then collected in a crucible on ash-free filter paper, burned, and weighed. The % yield of acid-insoluble ash was then computed using the medication that had been air-dried.

   % Acid insoluble ash value = Wt. of acid insoluble ash/ Wt. of crude drug taken X 100

iii. **Water soluble Ash value**- Boiled the total ash for five minutes with 25 ml of water; collected the soluble matter in a crucible, ignited, and weighed. Calculated the percentage or water soluble ash with reference to air dried drug.

% water insoluble ash = wt. of total ash – wt. of water insoluble ash / wt. of crude drug taken X 100

Determination of extractive values

Determination of extractive values is useful for evaluation of crude drug. It gives idea about the nature of the chemical constituents present in a crude drug.

Alcohol soluble extractive value

In a stoppered flask, macerate 5 grams of precisely weighed coarse powdered medication with 100 millilitres of 90% v/v alcohol for 24 hours, stirring the flask often for the first 6 hours quickly passed through filter paper while being cautious not to lose too much alcohol. 25 millilitres of alcoholic extract were dried out in a tray and then weighed. The following formula was used to get the percentage w/w of alcohol soluble extractive in relation to the air-dried medication.

Extractive value = weigt of residue /weight of crude drug taken *100

Results and Discussion

Macroscopic characteristics of root of *Abutilon indicum*

1. **Shape** - Cylindrical or slightly straight.
2. **Surface characteristic –** Surface was fissured, longitudinal corru-gations were present on it's surface.
3. **Colour** – Yellowish Brown
4. **Odour** – odourless
5. **Taste** – characteristic

Macroscopic characteristics of Leaf of *Abutilon indicum*

1. **Shape** - oval
2. **Surface characteristic** - Surface was Rough
3. **Colour** – Light Green
4. **Odour** – Characteristic & persistent
5. **Taste** – Slightly Sweet

Histological study of Root

A thin cork of four to seven or more tangentially elongated rectangular cells, cork cambium and at the lenticel regions are followed by two or three layers of secondary cortex layers of thin- walled, nearly cubical or rectangular cells, with small clusters of calcium oxalate in the majority of cells, and phellogen, which is followed by three to four layers of thin-walled cells of cortex.

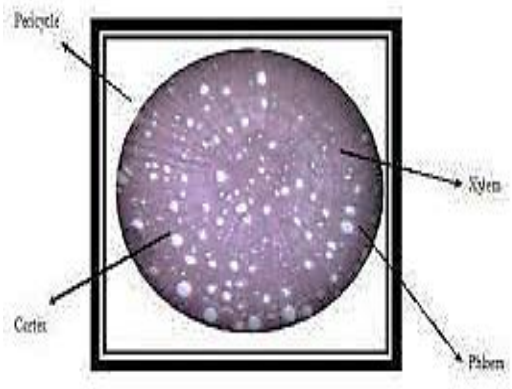


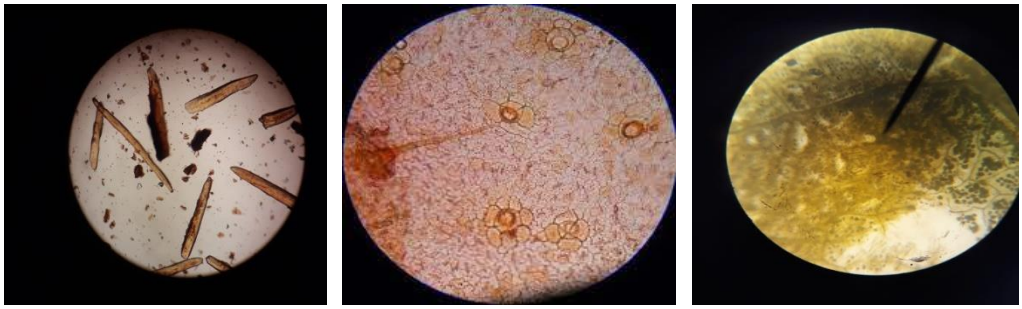
Figure-2 T.S. of *Abutilon indicum* Root

a. Study of Root powder

The root powder had a distinct smell, a slightly bitter flavor, and a brilliant yellow to brownish yellow colour. The following reagents were used to observe calcium oxalate crystals, tannins, and starch grains in the root powder.

Table-1 Characteristics of Powder microscopy of *Abutilon indicum* Root

S. NO.	Reagents	Observation	Inference
1.	Iodine solution	Blue color	Starch grains present
2.	FeCl3 Solution	Blue black color	Tannins were present
3.	Lectochloral	Observed calcium oxalate crystals	Calcium oxalate crystals Present



[A]- Starch present **[B]- Tannins present** **[C]- Calcium oxalate crystals Present**

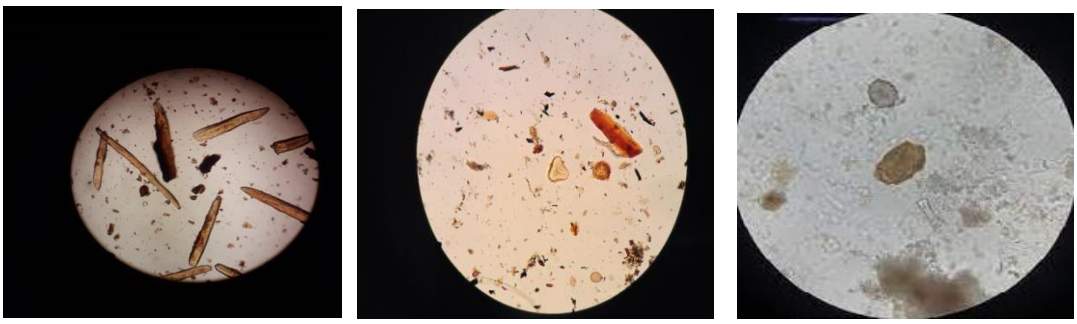
Figure-4 Powder Microscopy of Root

Study of leave's powder

The powdered leaves had a distinctive smell, a slightly sweet flavor, and a brilliant yellow to greenish color. The following reagents were used to observe calcium oxalate crystals, tannins, and starch grains in the leaf powder.

Table-2 Characteristics of Powder microscopy of *Abutilon indicum* Leaf

S. NO.	Reagents	Observation	Inference
1.	Iodine solution	Blue colour	Starch grains present
2.	FeCl3 Solution	Blue black colour	Tannins were present
3.	Lectochloral	calcium oxalate crystals	Calcium oxalate crystals Present



[A]- starch present **[B]- Tannins present** **[C]- Calcium oxalate crystals present**

Figure-5 Powder Microscopy of Leaves

Physicochemical Evaluation for Root

According to WHO guidelines, root powder was examined for physicochemical findings were discovered: drying loss, ash levels, and extractive values.

characterisation in this study.

Table-3 Physicochemical Parameters of *Abutilon indicum* Root

S. No.	Physical Constants	Results
1.	Loss on drying	5.25%
2.	Total ash value	7.67%
3.	Acid-insoluble ash value	1.%
4.	Water soluble ash value	4.33%
5.	Alcohol soluble extractive value	4.6%
6.	Water soluble extractive value	9.89%

Physicochemical Evaluation for Leaves

According to WHO guidelines, leaf powder was examined for physicochemical characterisation in this study. The following findings were discovered.

Table 4 Physicochemical Parameters of *Abutilon indicum* Leaves

S. No.	Physical Constants	Results
1.	Loss on drying	6.47%
2.	Total ash value	7.53%
3.	Acid-insoluble ash value	1.%
4.	Water soluble ash value	4.31%
5.	Alcohol soluble extractive value	3.81%
6.	Water soluble extractive value	9.74%

Conclusion

The roots and leaves of *Abutilon indicum* were the focus of a pharmacognostic investigation in this study. Several standardized characteristics, including macroscopic and microscopic analysis, drying loss, ash values, extractive values, etc., were established for the *Abutilon indicum* root and leaf in pharmacognostic research. It was discovered that the crude drug's water-soluble extractive value was greater than its alcohol-soluble extractive value.

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Disclaimer Statement

Authors declare that no competing interest exists. The products used for this research are commonly used products in research. There is no conflict of interest between authors and producers of the product.

Reference

1. Ghose, D. and Laddha, K. Herbal Drug Extraction: An Update Chemical Weekly. 2005; p_p.185-190.

2. *National Medicinal Plants Board*, GoI website(http://nmpb.nic.in).

3. Khare, C. P. *Indian medicinal plants-Abutilon indicum;* p.3-4

4. Wn.wikipedia.org/wiki/ *Abutilon indicum* (Accessed in April 2013).

5. *The Ayurvedic Pharmacopoeia of India*, Vol. I., Part-I. Sahacara (Whole plant) p. 25-28.

6. Vogel's Text book of quantitative chemical analysis. 6th Edition; Delhi; Pearson.

7. Kaushik, P.; Kaushik, D.; Khokra, S. and Chudhary, B. *Abutilon indicum* (Atibala) Ethanobotany, Phytochemistry and Pharm-acology- A Review. *Int. J. of Pharmaceutical and Clinical research*; 2009; 1(1):4-9.

8. *The Ayurvedic Pharmacopoeia of India;* Vol. I; Part-I (I Edition); Appendix-2; p. 206.

9. Standards of Identity. *American Herbal Pharmacopoeia*; Available from htpp://herbal -ahp.org.

10. WHO Guidelines on quality control methods for medicinal plant material. *World Health Organization*; Geneva.

11. Khandelwal, K.R. Practical Pharmacognosy; 14th Edition. Nirali Prakashan; Pune; 2005; p. 11.