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Pharmacognstic evaluations of *Morus alba* L

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Abstract
Mulberry is a very widespread and important crop for silkworm feed, fruit and timber as well as being an excellent amenity tree. Its leaves and young bark are recognized as excellent animal feed and are used as a by-product. The leaves of mulberry along with other herbals have been used in Chinese medicine and herbal teas and consumed occasionally which undermines the position that the use of these herbs as flavoring agents in herbal tea beverages is GRAS. Hence the Food and Drug Administration agency may not treat the species as GRAS.
The leaves are antibacterial, astringent, diaphoretic, hypoglycaemic, odontalgic and ophthalmic. They are taken internally in the treatment of colds, influenza, eye infections and nosebleeds.
The stems are antirheumatic, diuretic, hypotensive and pectoral. A tincture of the bark is used to relieve toothache. The Plant is Pharmacognsotically standardized in the present study.

Keywords: *Morus alba*, Mulberry, TLC, Physicochemical Anatomical Microbial limits

Introduction
Morus alba also known as mulberry belongs to Moraceae family, is an Small to medium-sized monoecious or dioecious shrub or tree used primary for Mulberry foliage, food for silkworm, which for centuries supported the silk industry, as fodder, natural dyes, cosmetic products and traditional medicine. They are distributed into the sub-tropic regions of Asia such as Japan, India, China and Korea. Mulberry has been commonly used in Ayurvedic and many traditional systems for a long period of time as therapies for laxatives, bronchitis, insomnia, odentalic emetic, edema, toxin-adsorbents and wound healing. Mulberry is non-toxic natural therapeutic agent shown to possess hypoglycemic, hypotensive, and diuretic properties, Nephroprotective, Hepatoprotective Effect, Immunomodulatory, Antistress, Antimicrobial, Anticancer etc properties, due to the presence of several phytoactive constituents such as ascorbic acid, carotene, vitamin B1, folic acid, folinic acid, and vitamin D, rutin, quercetin etc. Shrubs or trees 3-10 m tall. Bark gray, shallowly furrowed. Branches finely hairy. Winter buds reddish brown, ovoid, finely hairy. Stipules lanceolate, 2-3.5 cm, densely covered with short pubescence. Petiole 1.5-5.5 cm, pubescent; leaf blade ovate to broadly ovate, irregularly lobed, 5-30 × 5-12 cm, abaxially sparsely pubescent along midvein or in tufts in axil of midvein and primary lateral veins, adaxially bright green and glabrous, base rounded to ± cordate, margin coarsely serrate to create, apex acute, acuminate, or obtuse. Male catkins pendulous, 2-3.5 cm, densely white hairy. Female catkins 1-2 cm, pubescent; peduncle 5-10 mm, pubescent. Male flowers: calyx lobes pale green, broadly elliptic; filaments inflexed in bud; anthers 2-loculed, globose to reniform. Female flowers: sessile; calyx lobes ovoid, ± compressed, with marginal hairs; ovary sessile, ovoid; style absent; stigmas with mastoidlike protuberance, branches divergent, papillose. Syncarp red when immature, blackish purple, purple, or greenish white when mature, ovoid, ellipsoid, or cylindric, 1-2.5 cm. Fl. Apr-May, fr. May-Aug [1,2].
Extracts of mulberry leaves were evaluated for their potential to inhibit various micro-organisms; *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, *Tannerella forsythia* [3], *Staphylococcus aureus*, *Bacillus subtilis*, and *Bacillus pumilus* [4] possess good antibacterial activity. Further, they emerged as a good anti-oxidant candidate by having the ability to scavenge ($ABTS^+$) radical and (DPPH) radica [4]. Their cardio-protective potential when evaluated suggested that mulberry could reduce cholesterol synthesis thus having a positive effect [5].
Taken together, *Morus alba* has gained a profound interest as an upcoming nutraceuticals aimed at possessing profound health benefits due to their diverse pharmacological activities [6, 7]. To further authenticate and identify the plant, a thorough pharmacognostic examination was conducted, defining pharmacopoeial criteria for the plant.

Materials and Methods
Voucher specimen: The plant materials were collected and Identity was confirmed with the voucher specimen using [8]. Physico-chemical values such as the percentage of total ash, acid-insoluble ash, and water and alcohol-soluble extractives were calculated as per the Ayurvedic Pharmacopeia of India, [9].
TLC fingerprinting profile carried as per [10]. For the Anatomical studies, transverse sections (TS) and powder microscopy studies were prepared and stained [11, 12]. A standard guideline for total microbial Limit count was provided by WHO [13].

Results and Discussions

Table 1: Pharmacognosy features

Physicochemical Constants			Organoleptic Characters	
Parametrs	Values	Limit	Parametrs	Values
TA	15.15%	NA	Taste	
AIA	4.75%	NA	Color	Green
ASE	2.4%	NA	Odour	Mild
WSE	12.95%	NA	Texture	Fibrous

TA - Total Ash; AIA - Acid Insoluble Ash; ASE - Alcohol Soluble Extractive; WSE - Water Soluble Extractive; NA-Not available Physicochemical criteria help to find genuine plant content and Adulteration inspections such as salts, silica or unsafe handling of raw materials. Organoleptic properties are distinct (table 1)

Table 2: TLC Profile

TLC Finger Printing Profile								
Under Visible Light								
Rf Values	0.02	0.04	0.1	0.38	0.61	0.75	0.89	-
Sprayed with 10% H_2SO_4								
Rf Values	0.05	0.1	0.27	0.38	0.55	0.72	0.9	0.95
Sprayed with Anisaldehyde								
Rf Values	0.03	0.06	0.14	0.31	0.42	0.58	0.75	0.92
Under Short UV (254 nm)								
Rf Values	0.06	0.12	0.79	0.91	-	-	-	-
Under Long UV (366 nm)								
Rf Values	0.06	0.13	0.18	0.26	0.45	0.65	0.79	-

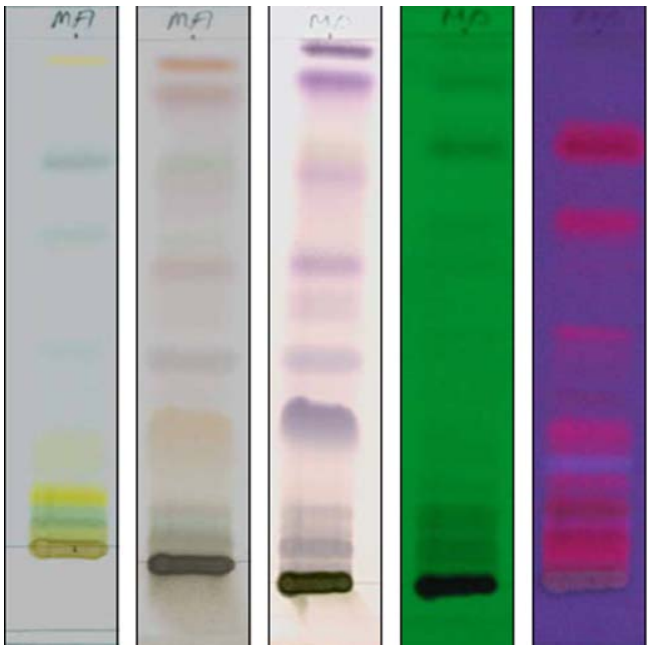

Fig 1: TLC Chromatograms

Morus alba showed 7 band under visible light, 8 bands when sprayed with 10% H_2SO_4 and 8 bands when sprayed with Anisaldehyde. Further, 4, 7 bands were observed under short and long UV light respectively. The results are qualitative TLC finger print profile of plant under study (table 2, fig 1)

Anatomical Characters

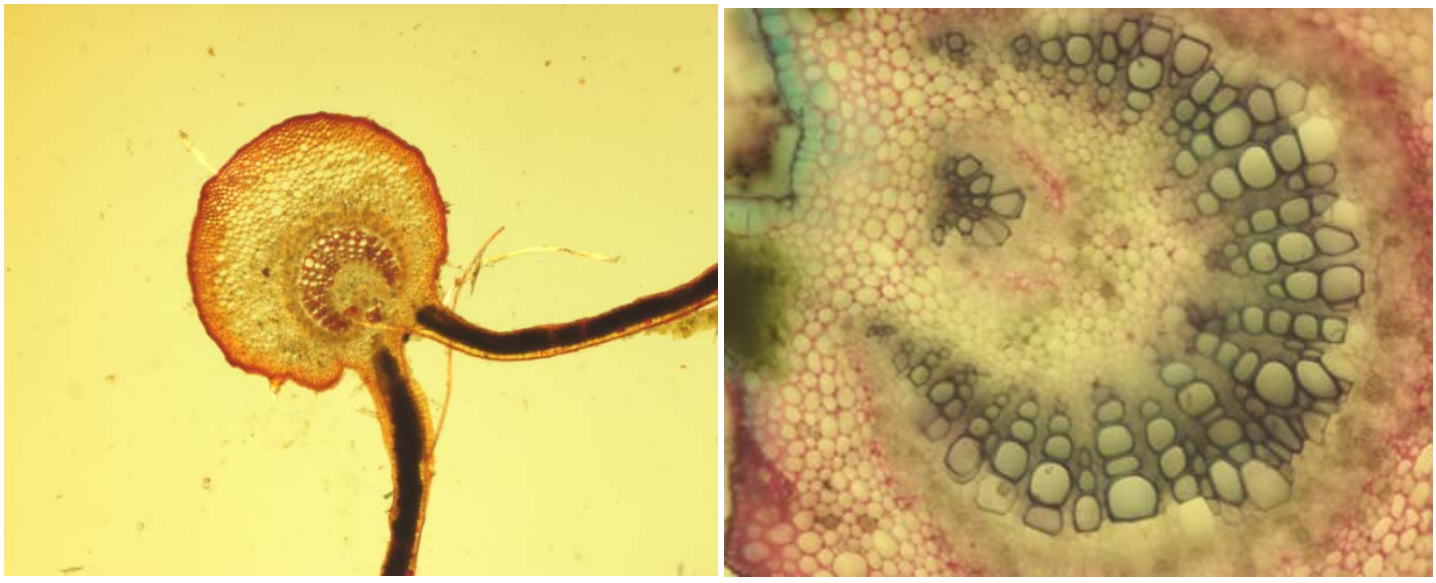

Fig 2: Anatomical Characters of *Morus alba*

T.S of leaf shows single layered epidermis consists of upper and lower surface of leaf, which are dumble shaped and stomata's are present. Midrib shows single layer of epidermis covered with thin cuticle, after epidermal layer 3-4 layers of collenchyma cells, in the cortical region composed of parenchyma cells and vascular bundles, Xylem cells surround phloem cells; protoxylem cells present towards epidermis and metaxylem cells are present towards the cortical region. Calcium oxalate crystals are present (fig 2).

Powder Characters: Powder Colour: Green:

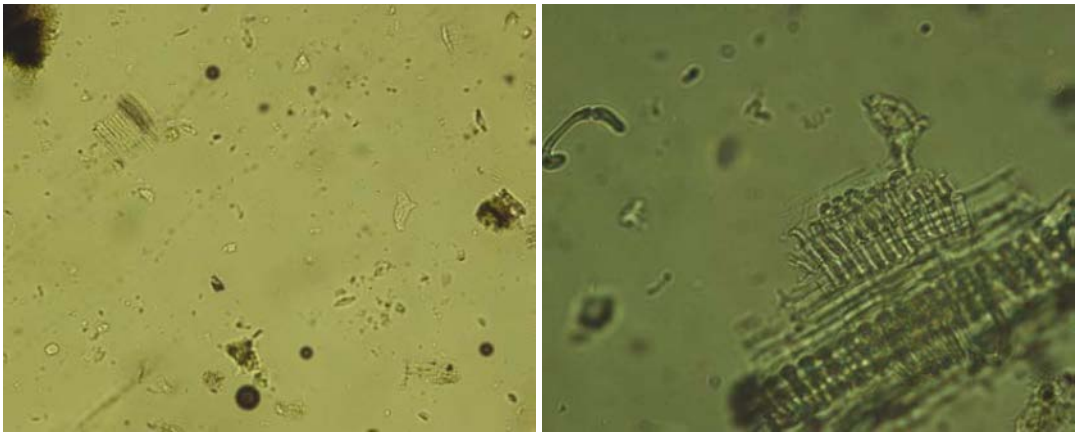

Fig 3: Powder characteristics of *Morus alba*

1. Abundant palisade parenchyma cells and epidermal cells,
2. Vessels, phloem fibers and trachieds are present,
3. Number of calcium oxalate crystals and starch grains are seen.
4. Stomats are seen on surface view.

Powder microscopy permits to acquire knowledge about the various broken bits of the sample that are specific and play a key role in the recognition of the raw sample (fig 3).

Microbial Limit Test

Total Aerobic Bacterial Count (TABC): 1.9 x 10^3
Total Yeast and Mould Count (TYMC): 0.9 x 10^3
(Microbial contamination limit for raw herbs - TABC: $<10^7$, TYMC: $<10^5$)

All criteria were within the limits specified by the WHO Guidelines and Indian Herbal Pharmacopeia.

Conclusion

Validation and verification of pharmacologically significant plants using a variety of pharmacognostic approaches, including macroscopic, microscopic and physico-chemical parameters, are key requirements. Taking that into account, the present study was designed to standardize *Morus alba*, which could serve as a potential resource. Physciochemical factors will help to authenticate the sample of the plant. The TLC profile will act as a fingerprint profile for the plant. Organoleptic, anatomical and powder microscopic assessments are plant-specific. The microbial limit of the raw material was in accordance with the standards laid down.

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