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Ethnomedicinal, phytochemical and pharmacological properties of *Mangifera indica* L: A review

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Abstract
Mangifera indica L. is a substantial evergreen tree which comprises of around 30 species of tropical fruiting tree of family Anacardiaceae. It is cultivated on a region of approximately 3.7 million ha worldwide and vanquishes the second position as a tropical yield, in term of production. Attributable to rich medicinal properties, *Mangifera indica* generally known as Mango (Aam) has a long history of utilization in the home as an herbal remedy since old times. Different parts of the plant have been utilized for curing different illnesses. *Mangifera indica* is a natural product as well as an important medicinal plant. The leaves have been accounted for to contain saponins, glycosides, sterols, polyphenols, mangiferine and tannins and so on. It is traditionally known to be valuable for the treatment of different ailments like urinary tract infections, diuretic, throat disease, Malaria, Skin infection, dysentery, diarrhea, bums, scalds etc. *Mangifera indica* possesses anti-oxidant, anti-microbial, gastro protective and several potential pharmacological activities. This review deals with phytochemical, pharmacological and ethno medicinal activities of this medicinal plant and it also gives steady confirmation about the therapeutic effects using herbal drugs as a therapeutic agent might have to reduce the economic burden due to easy availability in nature it also help to reduce side effect of various allopathic medicines.

Keywords: phytochemical, Ethnomedicinal, pharmacological

1. Introduction
India having different frameworks of wellbeing like Ayurveda, Unani, Siddha, Homeopathy and Naturopathy that mentioned even in the Vedas and different sacred writings. These systems existed one next to the other with allopathy containing long, protected and continuous use of numerous herbal drugs [1]. Nearly 80% of the total populace depends on traditional medicines for essential social health care, the majority of which include the utilization of plant extracts [2]. The investigation of plants proceeds essentially for the discovery of novel secondary metabolites. Around 80% of items are of plant source and their deals surpassed US $65 billion in 2003 [3]. *Mangifera indica* L. is an large evergreen tree, with a substantial, dome-shaped crown. It has a place with the family Anacardiaceae. It is found in the tropics where it is utilized as a medicinal plant [4]. Fruits contain protein, minerals, fat, sugar, vitamins A, B, C and amino acids. The fruits also likewise yield a resin that is said to contain mangiferin, mangiferic acid, resinol and maniferol and others [5, 6]. The leaves have been accounted for to contain glycosides, sterols, polyphenols, tannins, euxanthin acid, saponins, mangiferin, mangin etc. The ashes acquired from the leaves are utilized to treat bums, scalds, sores, cough and diarrhea in different parts of the world [5, 7]. The leave, bark and root are utilized to treat Oral candidiasis, Malaria, Skin infection, dysentery, diarrhoea, thrush and shingles reported in various ethnobotanical surveys [8, 9]. Phytochemical screening is critical in distinguishing new wellsprings of therapeutically and industrially important compounds like alkaloids, flavonoids, phenolic compounds, saponins, steroids, tannins, terpenoids and so on [10]. The present review is hence a push to give the point by point investigation of literature on its ethnomedicinal, phytochemical, antimicrobial and pharmacological properties.

2. Scientific classification
Kingdom: Plantae
Subkingdom: Tracheobionta
Order: Sapindales
Division: Magnoliophyta
Family: Anacardiaceae
Class: Magnoliopsida
Subclass: Rosidae
Genus: Mangifera L.
Species: *Mangifera indica*

3. Vernacular names of *Mangifera indica* L.
Hindi: Aam
English: Mango
Oriya: Aamba
Bangali: Aam
Sanskrit: Ambrah, Aamra
Tamil: Ambiram, Mangas, Mau, Mampalam
Malayalam: Amram, Manga
Kannada: Mavina Telgu Mangai, Māmiḍi
Marathi: Amchur, Amba
Gujarati: Ambo
Punjabi: Amb, Wawashi

4. Botanical Description
Tree is medium to large (10-40 m in height), evergreen with symmetrical, rounded canopy ranging from low and dense to upright and open. Bark is usually dark grey-brown to black, rather smooth, superficially cracked or inconspicuously fissured, peeling off in irregular, rather

thick pieces. The tree forms a long unbranched long tap root (up to 6-8 m and more) plus a dense mass of superficial feeder roots. Effective root system of an 18- year old mango tree may observe a 1.2 m depth with lateral spread as far as 7.5m [11]. The leaves are simple alternately arranged, 15-45 cm in length. The petiole varies in length from 1 to 12 cm, always swollen at the base. Leaves are variable in shapes like oval-lanceolate, lanceolate, oblong, linear-oblong, ovate, obovate-lanceolate or roundish oblong [12]. The upper surface is shining and dark green while the lower is glabrous light green. Hermaphrodite and male flowers are produced in the same panicle, usually with a larger number of the later. The size of both male and hermaphrodite flowers varies from 6 to 8 mm in diameter. They are sub-sessile, rarely pedicellate, and have a sweet smell. The pollen grains are of variable shapes, with the size varying from 20 to 35 micron [13, 14]. The fruit is more or less compressed, fleshy drupe, varies considerably in size, shape, color, presence of fiber, flavor, taste and several other characters.

5. Ethnomedicinal uses

M. indica L. is commonly used in folk medicine for a broad diversity of remedies. The root, bark, leaves, flowers; unripe and ripe fruit are acrid, cooling and astringent to the bowels and have been employed in Ayurveda. Various parts of *M.indica* are used for more than thousands of years as wide variety of ethnomedicinal use (Table 1)

Table 1: Traditional and ethnomedicinal uses of various parts of *M. Indica* L.

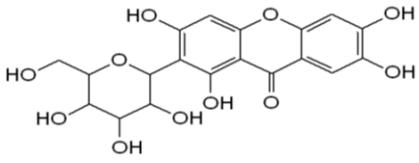
S. No.	Plant part used	Ethnomedicinal uses	References
1	Root	▪ Cures fever, healing of mouth wound. ▪ Blood sugar.	15 16
2	Leaves	▪ Cure dysuria accompanied by pain and burning. ▪ Dysentery, scalds and burn. relapse sickness ▪ Contraception and abortion ▪ Cough, hiccup, hyperdipsia, burning sensation, hemorrhages, haemoptysis, haemorrhoids, wounds, ulcers, diarrhoea, dysentery, pharyngopathy, scorpion string and stomachopathy	17 18 19 20
3	Stem & bark	▪ Syphilis, wounds, ulcers, and rheumatism ▪ Anemia, scabies, diabetes, cutaneous infections, menorrhagia, diarrhea. ▪ Pitta, metrorrhagia, calonorrhagia, pneumorrhagia, lecorrhoea, uteritis, wounds, ulcers and vomiting	21 22 20
4	seeds	▪ Seed kernel in hemorrhages and bleeding hemorrhoids, seed can also applied on burn, to treat Asthma ▪ Cough, helminthiasis, chronic diarrhea, dysentery, haemorrhages, haemoptysis, haemorrhoids, ulcers, bruises, leucorrhoea, menorrhagia, diabetes, heat burn and vomiting	23 20
5	flower	▪ Astringent, refrigerant, styptic, vulnerary, constipating and haematinic, wounds, ulcers, anorexia, dyspepsia, uroedema gleet, catarrh of bladder, diarrhoea, chronic dysentery and anemia ▪ Diarrhea, chronic dysentery. Powder help to reduce allergy (dermatitis)	20 24
6	Fruits	▪ Used in sunstroke, opthalmia, eruption, intestinal disorder, in fertility, night blindness, the oil used in eczema.	(25-27)

6. Phytochemical investigation

The critical constituents introduce in *Mangifera indica* are polyphenolics, flavonoids and triterpenoids. It furthermore contains mangiferin (xanthone glycoside), isomangiferin, tannins and gallic acid. The bark is represented to contain protocatechic destructive, catechin, mangiferin, alanine, glycine, γ-aminobutyric acid, kinic acid, shikimic acid and the tetracyclic triterpenoids [28]. After the separation of stem bark of *Mangifera indica*, Indicoside An and B, manghopanal, mangoleanone, friedelin, cycloartan-3β-30-diol and subordinates, mangsterol, manglupenone, mangocoumarin, n-tetacosane, n-heneicosane, n-triacontane and mangiferolic acid methyl ester and others were found [29, 31].

Structure

Mangiferin
Formula: C19H18O11
Molar mass: 422.33 g/mol



7. Antibacterial activity

Petroleum ether, ethyl acetate, ethanolic extract of *Mangifera indica* demonstrated huge action against four clinical strains of microscopic organisms *S. typhi*, *B. subtilis*, *E. coli* and *K. pneumonia*. The standard medication utilized was amoxicillin 5mg/ml. All solvents extracts at measurements extend 2mg/ml-4mg/ml demonstrated noteworthy antibacterial activity [32].

The aqueous and ethanol extracts of leaves and stems of *Magnifera indica* at 50 and 25 mg/ml has been found adequate action against microscopic organisms; *S. aureus*, *S. pyogenes*, *S. pneumoniae*, *P. aeruginosa* [33]. The antibacterial capacity of extracts likewise found against *S. enterica*, *L. monocytogenes*, and *E. coli* [34]. Antibacterial activity of *Mangifera indica* leaf on methanol, ethanol and benzene concentrate were examined against microorganisms some as *P. vulgaris*, *P. fluorescens*, *S. flexneri*, *K. pneumonia and S. typhi* at 100µl/ml concentration [35]. Antibacterial movement of mango concentrates upon gram-positive, gram-negative microscopic organisms [36, 37] and it is imagined that the antibacterial action of *Magnifera indica* extract is because of presence of secondary metabolites like gallo tannin, flavonoids, phenolic compounds, saponins, steroids, terpenoids, mangiferin etc. [38].

Ethyl acetate, ethanolic extract of *Mangifera indica* demonstrated huge action at measurement extend 2mg/ml-4mg/ml against four UTI causing clinical strains of

microscopic organisms *S. typhi*, *B. subtilis*, *E. coli* and *K. pneumonia* [39]. Disc diffusion method was used for antibacterial screening. Methanol extract demonstrates most extreme growth of inhibition against *Salmonella*. However all extract indicates antibacterial movement against pathogenic microorganism's strain [40].

The in-vitro anti-microbial activities of methanol and ethanol extracts of *Mangifera indica* seeds were researched and the outcomes uncovered great inhibitory impacts against every single tested strain [41].

8. Antifungal activity

Mangifera indica leaves extracts indicated antifungal activity that was tasteful. Leaves extract (4mg/20ml) of *Mangifera indica* demonstrated a conspicuous critical level of anti-fungal activity against *Aspergillus ustus*, *Aspergillus Niger* and *Aspergillus ochraceus* [42].

The antifungal capability of methanol, ethanol and aqueous extracts was found against *Alternaria alternata* at 6.25 mg/ml concentration [43].

9. Pharmacological Activities

9.1. Diuretic activity

Diuretic activity of *Mangifera indica* bark and leaves extract was studied by Shree Devi. They use Ethyl acetate, ethanol and aqueous extract of *Mangifera indica* for examination of diuretic activity. Diuretic effect was carried out in rats (175 – 200 kg body wt.) by measuring the urine volume by 1, 2, 4, 6 hours and later at 24 hours. Positive control was supplied by furosemide (20mg/kg) i.p. and mannitol (100mg/kg) i.v. They administered the extract orally at the dose of 250 mg/kg body weight. Diuretic study revealed that Na+/ K+ ratio was higher in aqueous extract and followed by ethanol and ethyl acetate extracts. The aqueous extracts show best diuretic effect when compared with other extracts [44].

9.2. Kidney damage

Uncovered critical prophylactic impact against kidney injury by upgrade of the kidney work by means of diminishing serum creatinine, urea and uric acid. Treatment of rats with 500 and 1000mg/kg MPS extract altogether expanded the level of reduced glutathione (GSH) and superoxide dismutase (SOD) activity while decreased the level of aggregate malondialdehyde (MDA) and glutathione-S-transferase (GST) [45].

10. Antioxidant activity

A few techniques have been utilized to determine antioxidant activity of plants. Study included three methods to assess the antioxidant activity of the mango seed extract, specifically, DPPH radical scavenging activity, ABTS cation radical scavenging activity and ferric thiocyanate test in comparision to α-tocopherol, ascorbic acid, methyl gallate and tannic acid. The consequence of the study uncovered that the extract has significant anti-oxidant activity [46].

Reactive oxygen species (ROS) have a solid oxidizing impact and initiate harm to biological molecules, including proteins, lipids and DNA, with contaminate changes in their structure and function [47]. The significant food antioxidants for example, vitamin E, vitamin C and beta-carotene, might be beneficial to keep a few chronic disorders considerable interest has emerged in the possible reinforcement of antioxidant defenses, both for chemoprevention and treatment purposes. The imbalance between the oxidative stresses and anti-oxidant defiance can be remedied by supplementing natural anti-oxidant resistances. It can forestall or hinder the movement of ailment. Potential anti-oxidant treatments incorporate characteristic anti-oxidant enzymes and vitamins or synthetic agents with anti-oxidant treatment [48].

11. Conclusion

The review *Mangifera indica* L. is a important medicinal plant utilized for the treatment of Urinary disorders and different diseases. The roots, leaves, stem and bark, flowers, fruits, seeds of plant are utilized as ethnomedicine. The broad literature revealed that the phytoconstituents and pharmacological activities are available in the *Mangifera indica*. The plant is successful for the herbal and Ayurvedic pathway for the treatment of different diseases. More assessment should be carried on the plant so that the commercial manufacture of the active constituents from these enhanced tip top lines would be valuable and productive.

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