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Madhuca indica: An untapped forest tree for its medicinal uses

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Abstract
Madhuca indica (Mahua) is a plant of Indian origin having tremendous therapeutic potential but is not fully utilized. It is hidden from the eyes of the researchers and other botanist. Mahua has several pharmacological activity, and potential to provide health to the society. It is used as Anti diabetic, antiulcer, hepato protective, anti-pyretic, anti-fertility, analgesic, anti-oxidant, swelling, inflammation, piles, emetic, dermatological, laxative, tonic, anti-burn, anti-earth worm, wound healing headache and many more problems. Here is a misconception about mahua tree that it is used as liquor and harmful for health, but this is what after the fermentation process, so the present article deals with the general and chemical profile of Mahua and its medicinal and other uses, and tried to emphasize the most potent activity.

Keywords: *Madhuca indica*, therapeutic, phytochemicals, anti-diabetic, anti-ulcer, hepato protective

Introduction
Madhuca indica is commonly called Butter tree or Honey tree, which belongs to Sapotaceae family. Madhuca is generally known by the name of Mahua. Mahua a plant of Indian origin having tremendous therapeutic and potential use but due to unawareness of people it is not fully utilized. It is hidden from the eyes of the researchers and other botanist. Mahua tree have a lot of pharmacological potency for treatment of several diseases. Mahua is a forest tree found in central and northern India and Malaysia. It is commonly observed in various parts of the Indian sub-continent, including Bangladesh. In the folk medicinal system of Bangladesh, various parts of the tree are used, namely whole young plants, leaves, stems, barks, roots, fruits, flowers, and seeds.

The different ailments treated with these parts include tuberculosis, rheumatoid arthritis, cholera, paralysis, snake-bite, debility, tonsillitis, influenza, piles, arthritic pain, helminthiasis, low semen count, headache, flatulency, and infections, besides being used as a blood purifier and as an antidote to poison. Two proto basic glycosides, namely madhucosides A and B have been isolated from the bark of this tree and these two compounds showed significant inhibitory effects on both superoxide release from poly morph nuclear cells, and hypochlorous acid generation from neutrophils (Khan and Zahan, 2011) [13].

Mahua tree is generally valued for its seeds which have abundant amount of oil bearing capacity and flowers which are mostly used in the production of the alcoholic beverage and sweet candy. Spent flowers (after fermentation) are also used as animal feed. About 0.12 million tones seeds of Mahua tree are produced in India, after collecting it from different part of the country in organized sectors and utilized for oil extraction (Singh and Singh, 1990) [25]. The estimated production of Mahua flowers is more than one million tons in the country. The collection of Mahua flower and seed are encouraged by the state government of India, as they provide the basic support price for it, on the other way it is source of income for the poor people as they collect it and then sell it to the government agency or local buyer (Patel and Naik, 2010) [19]. With development of photochemical industries in India, domestic requirements for various medicinal plants grow considerably (Kokate *et al.*, 2008) [15].

Useful parts of plant
Every part of any plant possess some medicinal properties, either in small of large proportion. Different parts of a plant often contain a quit different active ingredients, so that one part may be toxic and another one quite harmless (Wyk and Van, 2004) [29]. The plant consist of several parts, they may be classified according to the function (Table 1.). They are root, bark, leaves, flowers, fruits, seeds, oil.

Table 1: Parts vise use of *Madhuca indica* (Anonymus, 2007, Seshagiri and Gaikwad, 2007) [3, 22].

Part of plant	Medicinal properties
Leaf	Enzyma, Wound Healing, Anti Burns, Bone Fracture, Emollient, Skin Disease, Rheumatism, Headache,
Oil	Laxative, Piles, Hemorrhoids, Emetics, Anti Earth worm.
Fruit	Sweet, Refrigerant, Aphrodisic, Tonic, Dipsica, Bronchitis, Astringent, Anti-Ulcer, Acute and Chronic Tonsillitis, Pharyngitis.
Bark	Gums, Tonsillitis, Diabetic, Stomach Ache, Anti Snake Poisoning, Astringent, Emollient, Fracture, Itching
Flower	Refrigerant, Liquor, Jelly, Sweet Syrup, Expectorant, Increase the production of milk in woman, Stimulant, Diuretics, Anthelmentic, Strangury, Verminosis, Hepatoprotective, Gastropathy

Phytochemicals: The leaves of Mahua tree contain saponin, an alkaloid, and glucoside. Sapogenin and other basic acid are found in the seeds. Various Photochemical studies on Mahua include characterization (Table 2.) of Sapogenin, triterpenoids, steroids, saponin, flavonoids and glycosides. In view of the aides and attributed medicinal properties new components including madhucic acid (Penta cyclic triterpenoids), madhushazone, four new oleanane type triterpene glycosides and madhucosides A and B (Bina *et al.*, 2010) [6]. The fresh flower of Mahua contains 2 acetyl 1 pyrroline, the aroma molecule. They also contain polysacheride which on hydrolysis give D-galactose, D-glucose, L-araninose, L-rhamose, D-xylose and D-glucuronic acid (Miller Lucinda, 2005) [16].

Table 2: Active constituent present in different parts of *Madhuca indica* (Anonymus, 2007, Behl and Sriwasrawa, 2002) [3, 5].

Part of plant	Phytoconstituents
Bark	Flavonoids, Triterpene, Sterol, ethylcinnamate, sesquiterene alcohol, a-terpeneol, 3ß-monocaprylic ester of eythrodiol and 3ß-capryloxy oleanolic acid, a- and ß-amyrin acetates
Latex	Soluble Resin, Insoluble Resin
Leaf	ß-carotene and xanthophylls;erthrodiol, palmitic acid, myricetin and its 3-Oarabinoside and 3-O-L-rhamnoside, quercetin and its 3-galactoside;3ß-caproxy and 3ß-palmitoxy-olean-12-en-28-ol, oleanolic acid, ß-sitosterol and its 3-O-ß-Dglucoside, stigmasterol, ß-sitosterol-ß-Dglucoside, n-hexacosanol, 3ß-caproxyolcan-12-en-28-ol, ß-carotene, n-octacosanol, sitosterol, quercetin. Moisture, Organic Matter, Minerals, Potas (K_2O) Phosphoric Acid (P_2O_5) Silica, Alkaloids, Flavonoids, Protobasic Acid.
Flower	Carotene, Ascobic Acid, Thiamine, Riboflavine, Niacine, Folic Acid, Biotine, Inositole
Ripe Fruit	a- and ß-amyrin acetates, Moisture, Protein, Fat, Carbohydrates, Minerals, Calcium, Phosphoras, iron, Carotine, Ascorbic Acid, Tannins
Seed	Arachidic, Linolelic, oleic, myrisic, palmitic and stearic acids, a-alanine, aspartic acid, cystine, glycine, isoleucine and leucine, lysine, methionine, proline, serine, threonine, myricetin, quercetin, Mi-saponin A & B.

Medicinal uses of Mahua

The seed fat has emulsion property so it mostly used as an emulsifying agents in few pharmaceutical industries. It is generally applied as massage oil in many part of the country, as it is very good to moisturize skin. The medicinal properties which are seen in this plant are stimulant, demulcent, emollient, heating, skin disease, rheumatism, headache, laxative, piles, and sometimes as galactogogue astringent and many more (Anonymus, 2007) [3]. Traditionally, Mahua bark has been used against diabetes, rheumatism, ulcers, bleeding and tonsillitis (Khare, 2000, Dahake Ashok and Chiratan, 2010) [10, 14]. The flowers, seeds and seed oil of Madhuca have great medicinal value. Externally, the seed oil massage is very effective to alleviate pain. In skin diseases, the juice of flowers is rubbed for oleation. It is also beneficial as a nasya (nasal drops) in diseases of the head due to pitta, like sinusitis (Dahake Ashok and Chiratan, 2010) [10]. The Mahua have several pharmacological potency and it is being used from the tradition. In Ayurveda, Mahua flowers are considered as to be cooling agent, carminative, galactagogue, and astringent (Sinha *et al.*, 2017) [26]. It is also reported to be beneficial for heart, skin, and eye diseases (Amia and Ekka, 2014) [2]. *Mahua* flowers are used traditionally as a remedy of many diseases by tribal people. Fresh juice of flower is utilized as tonic and also used to cure skin diseases, eye diseases, raktapitta and headache due to "pitta" (Sinha *et al.*, 2017) [26]. Sunita and Sarojini, 2013 [28], referred that tribal people offer raw flowers to lactating mothers for increasing their lactation. Roasted flowers are consumed to cure cough and bronchitis by local people (Palani, *et al.*, 2010) [17]. Acharya and Srivastava, (2008) reported that *mahua* flowers can cure impotency and general debility when consumed with milk. Flowers fried in ghee act as a cooling agent and help to cure piles (Sinha *et al.*, 2017) [26]. Few of its medicinal use are as follows:

1. Anti-inflammatory activity

The Mahua is found to be a good remedy for treatment of the inflammation, its aerial parts is utilized for the treatment of inflammation. The plant material (50 g) was extracted with 100 ml of methanol for 24 hrs. using soxhlet apparatus. Thus, extract were filtered and concentrated under vacuum sounding apparatus for 30 min. when this solution was given to the male vistar rat which was already having inflammation showed a satisfactory result (Shekhawat and Vijayvergia, 2010) [23].

2. Analgesic activity

The methanolic extract of Mahua was given orally to the group of 6 animals. The number of writhing during the following 30 min. period was observed after acetic acid injection. Anti-analgesia is expressed as the reduction of the number of abdominal constriction between control animal and mice pretreated with the extract (Shekhawat and Vijayvergia, 2010) [23]. In other words if the analgesic drug works the abdominal contraction will be the less in numbers. The analgesic activity of the Mahua can also be evaluated by the using other method of evaluation like tail flick method or hot plate method in rats (Shekhawat and Vijayvergia, 2010, Chakma Chirantan, 2011) [7, 23]. Significant reduction either in the reaction time hot plate, tail flick, gradient heat, abdominal constriction compared with vehicle treated animals was consider as anti-nociceptive response (Chakma Chirantan, 2011) [7]. Analgesic effect was studied through tail flick, hot

plate and chemical graded doses on mouse which shows analgesic effect as per dose value (Amia and Ekka, 2014, Verma *et al.*, 2014, Sinha *et al.*, 2017) [2, 26, 30].

3. Antipyretic activity

Mahua is used to treat the fever in individual, as it is experimented in animals. About 5 groups of 6 rats each were injected subcutaneously with 10 ml kg^{-1} body weight. Firstly the animal are forced to fever by injecting the suspension of the yeast suspension, this will increase the body temperature of the experimental animal. After measuring the basal rectal temperature of each animal by a help of thermometer, about 19 Hr. after yeast injection, the rectal temperature was recorded again and animal showing a rise in temperature of <0.6 °C were discarded. Rectal temperature was then recorded at 20-24 hr after yeast injection. After some time interval it is found in the reduction in the rectal temperature of rat, which shows the antipyretic effect of Mahua (Shekhawat and Vijayvergia, 2010) [23].

4. Anti-hyperglycemic activity

The significant hypo-glycemic effects of Mahua bark in diabetic rats indicate that this effect can be mediated by stimulation of glucose utilization by peripheral tissues. The results of the present study clearly indicated the ethanolic extract of Mahua bark to have a hypoglycemic effect on STZ induced diabetic rats 52. In all groups except for glibenclamide, at 30 min of initiating glucose tolerance test, blood glucose concentration was higher than at zero time but decreased significantly from 30 min to 120 min. Methanolic extracts were enhancing glucose utilization, thus the blood glucose level was significantly decreased in glucose loaded rats (Seshagiri and Gaikwad, 2007, Dahake Ashok and Chiratan, 2010) [10, 22]. Methanolic extract of Mahua have significantly decreased the serum glucose level in streptozotocin and STZ-NIC induced diabetic rats (Kumar Pavan and Vidyasagar, 2011). The crude methanolic extract of Mahua leaves demonstrated dose dependent reductions in serum glucose level following administration in glucose-loaded mice. The decreases in serum glucose levels were found to be significantly reduced at doses of 100, 250, and 500 mg extract per kg body weight. At these doses, the extract reduced serum glucose levels (Khan and Zahan, 2011, Chaudhary Anu and Bhandari Anil, 2011) [8, 9, 13].

5. Anti-ulcer activity

Anti-ulcer activity has been proved in Mahua plant while it is tested in the male vistar rat (Seshagiri and Gaikwad, 2007) [22]. To evaluate the anti-ulcer activity of the Mahua tree, firstly the animal is forced to produce the ulcer by any of suitable method like stress induced ulcer or carrageen induced ulcer, and then the same is treated with the extract of the tested plant materials.

6. Antioxidant activity

The reducing property of ethanolic bark extract of Mahua implies that it is capable of donating hydrogen atom in a dose dependent manner. The high content of phenolic compounds in the extract may be a contributing factor towards antioxidant activity because the phenol compounds are known to have direct antioxidant property due to the presence of hydroxyl groups, which can function as hydrogen donor. The reducing capacity of a compound may serve as a significant indicator of its potential antioxidant activity (Prashanth and Anil Kumar, 2010, Pawar Rahul and Bhutani, 2004) [21, 27]. The anti-oxidant potency of any drug depends upon the two mechanism, first to prevent the oxidation by oxidizing itself or second by creating a layer of protection over the material. As concentration of flower extract and ascorbic acid increases, the ferric reducing antioxidant power increases (Indu and Annika, 2014) [12].

7. Anti-fertility activity

The percentage of fertile male mice and the number of pregnancies were significantly reduced in atropine induced mice from control mice in present case there was complete reduction of fertility in male rat, number of pregnant females and number of litters in plant extract treated group. Among the plant based contraceptives Mahua Leaves, inhibition of male fertility after administration of natural substances has been related to decrease spermatozoa density. Also for male contraception, it is not necessary to stop spermatogenesis, but rather to eliminate the fertilizing ability of the spermatozoa by causing changes in the morphology or in the function of the sperm. The decrease in sperm count and the high number of morphologically abnormal sperms indicate interference with testicular spermatogenesis (Shivabasavaia and Ram Krishna, 2011) [24].

8. Dermatological use

Due to the present atmospheric condition and pollution skin related problem are emerging day by day, and there are few synthetic lotion and cream are available for it, but they cause several other side effect like rashes and itching too. That's why the use of medicinal or natural plant is much safer and convenient. The decoction of the bark is useful in itching and ulceration, the oil is obtained from the seed, which is useful in the several allergic disorders. It is also used as laxative (Behl and Sriwasrawa, 2002) [5].

9. Hepatoprotective activity

The methanol extracts of Mahua bark is studied for hepatoprotective activity against albino rats with liver damage induced by carbon tetrachloride (CCl4). It was found that the methanol extract of Mahua bark at a dose of 300 mg/kg body weight exhibited moderate protective effect by lowering the serum levels of Glutamate Pyruvate Transaminase (SGPT), Serum Glutamate Oxaloacetate Transaminase (SGOT), Serum bilirubin and Serum alkaline phosphate (SALP) to a significant extent. Present finding demonstrated the methanolic bark extract of Mahua could afford significant dose-dependent protection against CCl4 induced hepato cellular injury (Chaudhary Anu and Bhandari Anil, 2011) [8, 9]. Methanolic extract of flower showed potential protective effect by lowering the levels of SGOT, SGPT, ALP and total bilirubin by increasing serum level of total proteins and albumins (Sinha *et al.*, 2017) [26].

10. Anti-bacterial activity

The flower has an antibacterial activity against the *Escherichia coli* and resist against rice pest disease (Das and Choudhary, 2010) [11]. Aqueous extract showed more antibacterial activity than methanolic one for Bacillus subtilis and Klebsiella pneumonia (Patel *et al.*, 2012, Yadav *et al.*, 2012, Sinha *et al.*, 2017) [18, 26, 31].

11. Anti-epileptic activity

The anticonvulsant activity of the methanol extract of heart wood of *Madhuca longifolia* was assessed in pentylenetetrazole (PTZ) induced convulsion in mice with benzodiazepine as standard drug. Mechanistic studies were conducted using flumazenil, a GABA-benzo-diazepine receptor complex site antagonist, and naloxone a non-specific opioid receptor antagonist. *Madhuca longifolia* at the dose of 400 mg/kg prolonged the onset time of seizure and decreased the duration of seizures compared to saline group (Sandip *et al.*, 2011) [20].

12. Anti-cancer activity

In Ayurvedic system of medicine it is stated that the bark of Mahua is useful in the treatment of cancer at the local application (Premalata and Rajgopal, 2005) [4]. Cell viability was found to decreases as the concentration of floral extract increases and cytotoxic effect was found to increase (Indu and Annika, 2014) [12].

Conclusion

Plants are the important economical source of a number of well-established drugs looking upon wide prospects and potential of Mahua for various purposes; it is worthwhile to cultivate this plant on large scale especially on unproductive and wasteland. This will help in financial full support of poor and landless families. Generally this plant Mahua is known only for its liquor making purpose, but one have to come forward to change the thinking of unaware people. The Mahua tree is hidden from the public eyes as its medicinal point of view. As for the better potential, good quality of mahua tree should be cultivated through plant tissue culture by means of micro propagation. Mahua has found several of pharmacological activity, yet several other activities have to be finding out. In coming next generation the importance of mahua tree is going to be increase because of their effectiveness, easy availability, low cost and comparatively being devoid of toxic effect.

References

1. Acharya D, Shrivastava A. Indigenous Herbal Medicines: Tribal Formulation and Traditional Herbal Practices. Avishkar Publishers Distributors, Jaipur, 2008.
2. Amia E, Ekka N. *Madhuca longifolia* var. latifolia: An important medicinal plant used by tribes of north-east part of Chhattisgarh. OIIRJ. 2014; 4:227-231.
3. Anonymus. The wealth of India, Raw Material, Council of Scientific and Industrial Research, New Delhi, 2007, 6.
4. Balachandran Premalata, Govindarajan Rajgopal. Cancer an Ayurvedic Perspective. Pharmacological Research. 2005;5:19-30.
5. Behl PN, Sriwasrawa GS. Herbs Useful In Dermatological Therapy, CBS Publishers and Distributors, New Delhi, Edition 2, 2002, 94-95.
6. Bina Siddiqui S, Shazia Khan, Nadeem Kardar M. A New Isoflavone from the Madhuca latifolia. Natural Product Research. 2010;24:76-80.
7. Chakma Chirantan S. Pharmacological Screening of Isolated Compound from *Madhuca Indica longifolia* Seeds Give Significant Analgesic Effect. International Research Journal of Pharmacy. 2011;2:43-45.
8. Chaudhary Anu, Bhandari Anil. Anti-Diabetic Activity of methanolic Extract of *Madhuca Indica* on Normal and Streptozotocin Induced Diabetic Rats, International Journal of Pharmaceutical Research and Development. 2011;3:13-18.
9. Chaudhary Anu, Bhandari Anil. Hepatoprotective Activity of a Methanolic Extract of *Madhuca Indica* on Carbon Tetrachloride Induced Hepato toxicity in Rat. Pharmacology online. 2011;1:873-880.
10. Dahake Ashok P, Chiratan S. Antihyperglycemic Activity of Methanolic Extract of *Madhuka Lonifolia* Bark. Diabetologia Croatica. 2010;39:3-8.
11. Das BK, Choudhary BK. Quantitative Estimation of Changes in Biochemical Constituents of Mahua Flower during Post Harvest Storage. Journal of Food Processing and Preservation. 2010;34:831-844.
12. Indu S, Annika D. Cytotoxic and antioxidant potential of *Madhuca indica* flowers. World J Pharm Pharm Sci. 2014;3:2108-2114.
13. Khan Salehin, Zahan Dilara. Anti hyperglysemic Activity Studies with Methanol Extract of *Madhuca indica* J.F. Gmel. Leaves and *Paederia Foetida* L. Stem in Mice. Advance in natural and applied sciences. 2011;5:122-126.
14. Khare CP. Rational Western Therapy, Ayurvedic and Other Traditional Usage. Encyclopedia of Indian medicinal plant. Botany. Springer, 2000, 292.
15. Kokate CK, Putohit AP, Ghokhle SB. Pharmacognosy, Nirali Prakashan Fourty First Edition, 2008.
16. Miller Lucinda G. Herbal Medicinal, A Clinicians guide, Viva Book private Limited, New Delhi, Edition 1, 2005, 2-3.
17. Palani S, Raja S, Karthi S, Archana S, Kumar BS. *In vivo* analysis of nephro & hepato protective effects and antioxidant activity of *Madhuca longifolia* against acetaminophen-induced toxicity & oxidative stress. J Pharm Res. 2010;3:9-16.
18. Patel PK, Prajapati NK, Dubey BK. *Madhuca indica*: A review of its medicinal property. Int. J Pharma Sci. Res. 2012;3:1285-1293.
19. Patel Madhumita, Naik SN. Flowers of *Madhuca indica* J.F. Gmel: Present Status and Future Perspectives. Indian journal of Natural Products and Resources. 2010;1:438-443.
20. Patel Sandip, Patel Sandeep, Patel Veena. Investigation into The Mechanism of Action of *Madhuca longifolia* for its Anti-Epilepsy Activity. Pharmacognosy Communication. 2011;1:18-22.
21. Pawar Rahul S, Bhutani KK. Protobasic Acid Glycosides from *Madhuca indica* with Inhibitory Activity on Free Radical Release from Phagocytes. Journal Natural Product. 2004;67:668-671.
22. Seshagiri M, Gaikwad RD. Anti-inflammatory, Anti-ulcer and Hypoglycemic Activities of Ethanolic and Crudealkaloid Extracts of *Madhuca indica* Gmein Seed Cake: Oriental Pharmacy and Experimental Medicine. 2007;7:141-149.
23. Shekhawat Neha, Vijayvergia Rekha. Investigation of Anti-inflammatory, Analgesic and Anti Pyretic properties of *Madhuca indica* GMEL. International Journal of Molecular Medicine and Advance Sciences. 2010;6:26-30.
24. Shivabasavaiah, Ram Krishna. Anti-fertility Effect of *Madhuca indica* leaves in Male Swiss Albino Rats.

Journal of Pharmacy Research. 2011;4:323-326.
25. Singh Ajay, Singh IS. Chemical Evaluation of Mahua (*Madhuca indica*) Seed: Food chemistry, 1990, 221-228.
26. Sinha J, Singh V, Singh J, Rai AK. Phytochemistry, Ethnomedical Uses and Future Prospects of Mahua (*Madhuca longifolia*) as a Food: A Review J Nutr Food Sci, 2017, 1.
27. Srirangam Prashanth, Annsmpelli Anil Kumar. Anti-hyperglycemic and Antioxidant Activity of Ethanolic Extract of *Madhuca indica* Bark, International Journal of Pharmaceutical Science Review and Research. 2010;5:89-94.
28. Sunita M, Sarojini P. *Madhuca lonigfolia* (*Sapotaceae*): A review of its traditional uses and nutritional properties. Int. J Human Soc. Sci Invent. 2013;2:30-36.
29. Wyk Ben Erik, Van Wink Michael. Medicinal Plants of the World, Times Editions, Malaysia, Edition 3, 2004, 16-20.
30. Verma N, Jha KK, Kumar U, Deepak K, Singh NK, Singh AK. Biological Properties, Phytochemistry and Traditional Uses of *Mahua* (*Madhuca longifolia*): A Review. Ichnos. 2014;2:630-638.
31. Yadav P, Singh D, Mallik A, Nayak S. *Madhuca longifolia* (*Sapotaceae*), a review of its traditional uses, phytochemistry and pharmacology. Int. J Bio Med Res. 2012;3:291-305.