



Received on 27 January, 2012; received in revised form 29 February, 2012; accepted 19 April, 2012

MADHUCA INDICA: A REVIEW OF ITS MEDICINAL PROPERTY

Pushpendra K. Patel*, Narendra K. Prajapati and B.K. Dubey

T.I.T. College of Pharmacy, Department of Pharmacology, Anand Nagar, Bhopal- 462 021, Madhya Pradesh, India

ABSTRACT

Keywords:

Mahua,
Madhuca Indica,
Herbal plant,
Medicinal plant,
Toxicity

Correspondence to Author:

Pushpendra K. Patel

T.I.T. College of Pharmacy, Department
of Pharmacology, Anand Nagar, Bhopal-
462 021, Madhya Pradesh, India

Medicines obtained from plant source are known as an herbal medicine, and the herbal medicine are one which make human healthy without causing any of harmful effect. *Madhuca Indica* 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. *Madhuca Indica* 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 review deals with the general and chemical profile of *Madhuca Indica* and its economic importance including medicinal and other uses, and tried to emphasize the most potent activity.

INTRODUCTION: The universal role of plants in the treatment of disease is exemplified by their employment in all the major system of medicine, irrespective of the underlying philosophical premise¹. Plants are having a great importance to pharmaceutical industry, because these are rich source of drugs and a vast reservoir of chemical diversity for screening programs aimed at new drug discovery. Most of the drugs which are mention in the Indian medicinal system are from plant source². The duration of the mediaeval period is known as between 8th century to 18th century AD³.

Screening programs which are based on the part of natural plant have achieved great success in identifying very useful chemical constituents such as anticancer agent like vinblastine and vincristine, some cardio protective drugs like digoxine or digitoxin⁴. Plants have at one time supplied virtually all culture with food, clothing, shelter and medicine. Approximately 10 to 15 % of roughly 300,000 species of higher plants have

been used in traditional medicine system from last several years, as they are flows from generation to generation⁵. The Indian subcontinent is enriched by verity of flora, both aromatic and medicinal plants. This is due to the wide diversity of climatic condition available in India, ranging from deserts to swap lands. Numerous types of herbs have been well recognized and catalogued by botanist from the high ranges of Himalya⁶.

The world health organization is now actively focusing his attention towards the developing countries to encourage them to use herbal medicine, which they have been traditionally, used for centuries. They have identified 3000 plants from forest of India⁶. Herbal medicine can be defined as those products which are simply derived from the any part of plant⁷. The most advantage of the herbal medicine is that they contain a wide variety of different component⁸. India occupies the second place in the world for supplying the herbal and natural medicine of fine, pure and the best quality

⁹. Over the last few years, researchers have aimed at identifying and validating plant-derived substances for the treatment of various diseases. It is estimated that more than 25% of modern medicine is derived from the plants, means either their direct part is useful or their secondary metabolites are of prime importance ¹⁰⁻¹³. There are several other reasons for the adaptation of natural and traditional medicine, as these are useful without or less side effect and contra indication. The herbal medicine is not only used from recent time but it has been frequently used since the last thousands of years.

The knowledge of traditional medicine put the light on the discovery of new and potent medicine. The common difficulty that researchers and worker face with medicinal plant is about the purity of authentic information on the identity of the plant, its habit and the condition required for its collection and than its utilization as a medicinal plant ¹⁴. Another important thing about medicinal plant is prerequisites information for safety and efficacy must be known for address quality ¹⁵.

Madhuca Indica 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. *Madhuca Indica* 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 The two compounds showed significant inhibitory effects on both superoxide release from poly morph nuclear cells, and hypochlorous acid generation from neutrophils ¹⁶.

The Mahua tree is approximately 20 meters in height, and possesses evergreen or semi-evergreen foliage. 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 ¹⁷. 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 ¹⁸. With development of photochemical industries in India, domestic requirements for various medicinal plants grow considerably ¹⁹.

Family: Sapotaceae

Local names: English (Indian butter tree), Hindi (Mahua, Mohwa, mauwa), Bangali (mahwa, Maul, Mahwla), Marathi (mahwa, Mohwra) Gujrati (madhuda, Telgu (Ippa), Tamil (Illupei, Ewpa), Kannad (tuppe) Malyalam (poonam, Ilupa) Oriya (mahula, moha, Madgn) ²⁰

Habitat and Distribution: Our knowledge about the particular plant in our environment is far from complete. There are regions around the world where it is little difficult to categories or classify the plant ²¹. In India there is all type of climatic condition for better propagation and cultivation, which varies from hot to cold, humid to dry as we go in different part in India ²². The *Madhuca Indica* commonly known as Mahua is an important economic plant growing throughout the subtropical region of the indo-Pakistan subcontinent. Large numbers of Mahua trees are found in the state of Dehradun, Saharanpur, Chota Nagpur, Siwaliks, Uttar Pradesh, Madhya Pradesh, Orissa, Chhattisgarh, Jharkhand, Gujarat, Andhra Pradesh, Maharashtra, Bihar, West Bengal, North circars, Deccan and Karnataka ^{18, 20, 23}

Cultivation and Collection: This plant can be cultivated or self sown ²³. Flowering of this medium sized tree

take place during the season of March to April, in every years.

Botanical Description and Identification Features: A medium sized to large deciduous tree, usually with a short, hole and large rounded crown found throughout the green forest part of India up to an altitude of 1,200 meter and of 12 to 15 meter height, bark thick dark colored cracked, inner bark dark red, milk, trunk short, branches numerous²³. Leaves are 10-30 centimeter long, are thick and leathery most of leaves pointed at the tip, clustrescent glabred near end of branches, epileptic or elliptic oblong 7.5 to 23 cm into 3.8 to 11.5 cm. coriaceous pubeand when young almost. Flowers

are small and fleshy, dull or pale white in color and in define fascicles near end of branches. Corolla tubular, freshly pale, yellow aromatic and caduceus²⁴. Fruits are 2-6 cm long, fleshy and greenish. Bark dark color, cracked²⁵.

Useful parts of plant: Every part of any plant posses 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 harmless²⁶. The plant consist of several parts, they may be classified according to the function. They are root, bark, leaves, flowers, fruits, seeds, oil.



FIGURE 1: SOME USEFUL PARTS OF *MADHUCA INDICA*²⁷

TABLE 1: PARTS VISE USE OF *MADHUCA INDICA*^{25,28}

Part of Plant	Medicinal Properties
Leaf	Enzyma, Wound Healing, Anti Burns, Bone Fracture
Oil	Emollient, Skin Disease, Rheumatism, Headache, laxative, Piles, Hemorrhoids, Emetics, Anti Earth worm.
Fruit	Sweet, Refrigerant, Aphrodisic, Tonic, Dipsica, Bronchitis, Astringent, Anti Ulcer, Acute and Chronic Tonsillitis, Pharyngitis.
Bark	Rheumatism, Ulcer, Inflammation, Bleeding, Spongy 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.

Phytochemical: The therapeutic value of the plant depends on the active constituents present inside the different part of the plant, which may be present in the small or large quantity²⁹. The secondary metabolites are the important substance responsible for the main medicinal properties in the crude drugs²². 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 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 B²⁰.

The fresh flower of Mahua contains 2 acetyl 1 pyrroline, the aroma molecule. They also contain polysaccharide which on hydrolysis give D-galactose, D-glucose, L-araninose, L-rhamose, D-xylose and D-glucuronic acid¹⁵. To establish the pharmacological activity of particular crude drug is known as the pharmacological screening, and it is important for prediction of activity⁷.

TABLE 2: ACTIVE CONSTITUENT PRESENT IN DIFFERENT PARTS OF MADHUCA INDICA^{25, 30, 23}

Part	Phytoconstituents
Bark	Flavonoids, Triterpene, Sterol
Latex	Soluble Resin, Insoluble Resin
Leaf	Moisture, Organic Matter, Minerals, Potas (K ₂ O) Phosphoric Acid (P ₂ O ₅) Silica, Alkaloids, Flavonoids, Protobasic Acid.
Flower	Carotene, Ascorbic Acid, Thiamine, Riboflavine, Niacine, Folic Acid, Biotine, Inositol.
Ripe Fruit	Moisture, Protein, Fat, Carbohydrates, Minerals, Calcium, Phosphorus, iron, Carotene, Ascorbic Acid, Tannins.

Utilization:

Nutritional and Medicinal Use: The Mahua tree is having lots of nutritional value in it. It produces fruit which is valued for its seed which yield high quantity of fat commercially known as Mahua butter or mowrah butter, many edible and medicinal applications and it is also used as a biodiesel³¹. Its fat has been used as substitute for cocoa butter and ghee. It is one of the single largest sources of natural hard fat³². The fat which is thus obtained from Mahua fruit oil is used in cooking, frying and manufacturing chocolates. 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.

Besides edible and medicinal uses, Mahua has industrial application as it can be utilized in the manufacture of laundry soaps and lubricants³³. Moreover, the seed cake is reported to have insecticidal and pesticide property and used as organic manure in crops like rice, sugarcane etc. The medicinal properties which are seen in this plant are stimulant, demulcent, emollient, heating. Skin disease, rheumatism, headache, laxative, piles, and sometimes as galactagogue astringent and many more²⁵.

Review of literature based on chemical composition of mahua flower reveals its high nutritional value. Apart from being a rich source of sugar and protein, the flowers also contain essential minerals like Ca, P, Fe, and K. Calcium is a major component of the bone and assists in teeth development^{34, 18} phosphorus is next in importance to calcium as utilization of Ca is closely related to it. Most of the Calcium in the body is deposited as the calcium Phosphate³⁵.

Traditional use: Although Mahua tree is easily found in the several part of India, it is not used as a food material. Mahua flower occupy an important position in the life of the tribal in many parts of India³⁶. Only a small quantity of flowers is consumed in a raw, cooked or fried form in different parts of India. Major quantity of flowers is used in the preparation of the distilled liquors. The freshly prepared liquor has a strong, smoky foetid odor, which disappears on ageing²⁵. It is also seen that the bark of the Mahua tree is used to cure the fracture of bone. The most interesting thing about the Mahua tree is that it has two fruits in different seasons; the seed oil is extracted from it and used in the several different purposes. The wood of mahua tree is also used in the house hold utility like door and window making.

Sugar syrup: There are several reports on preparation of sugar syrup from dry Mahua flowers, as its sweet property is utilized in the fermentation process^{37, 38, 18}. The water extract of dried flower is decolorized with different de coloring agent like slacked lime and activated charcoal before concentrating it to the desired concentration. Activated charcoal at a concentration of 3.5-5% was found to be the best agent for the preparation of the Mahua sugar syrup¹⁸. The syrup thus obtained from the flower of Mahua is employed in the different purpose, either in the manufacturing of chocolate or as a sweetening agent²⁵.

Industrial use: Recently, biodiesel has been receiving increasing attention due to its less polluting nature and because it is a renewable energy resource as against the conventional diesel, which is a fossil fuel leading to a potential exhaustion. Mostly, biodiesel is prepared from oils like soybean, rapeseed, sunflower, safflower, zetropana etc. throughout the world³⁹.

Renewable biological sources such as vegetable oils and fats obtained from the animal are the richest source of the production of the biodiesel. Research have been carried out from the last several years to produce the new source of diesel which provide the alternative of present fuel, and this is continues from about 100 years ago but interest lagged because of cheap and plentiful supplies of petroleum fuels. The reason for the utilization of natural or vegetable as a new source of fuel is present status of demand. There is a increasing graph of the demand of the oil as the no. of vehicle are increasing day by day and the pollution is also running along with the no. of vehicles, so one has to look forward to prepare the another alternative source of diesel.

Since the oil price increase of the 1970s, various alternative fuels have been investigated with the goal of replacing conventional petroleum supplies. The initial interest was mainly one of fuel supply security, but recently more attention has been focused on the use of renewable fuels in order to reduce the net production of CO₂ from fossil fuel combustion sources⁴⁰.

Pharmacological profile: *Madhuca Indica*, belonging to the family Sapotaceae, is an important economic tree growing throughout India. Traditionally, *Madhuca Indica* bark has been used against diabetes, rheumatism, ulcers, bleeding and tonsillitis⁴¹⁻⁴³. 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^{42, 43}. The *Mahua* have several pharmacological potency and it is being used from the tradition. Few of its Pharmacological use are as follows;

- **Anti-inflammatory Activity:** The reason of the generation of the swelling or inflammation is release of the various chemical mediators from the damaged cell like histamine and serotonin⁴⁴. Inflammation is a defensive mechanism of the body⁴⁵. The most important mechanism of anti-inflammatory drugs is considered to be inhibition of PG synthesis at the site of injury. The anti inflammatory potency of drugs is corresponds with

their potency with to inhibit the COX⁴⁶. As more inhibition of COX means the anti inflammatory activity of that particular plant is more. The *Madhuca Indica* 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 result⁴⁷. Anti inflammatory effect can be measured as the percent inhibition of inflammation and calculated with reference to negative control²⁸.

$$\text{Percentage inhibition} = \frac{\text{Control - Treated}}{\text{Control}} \times 100$$

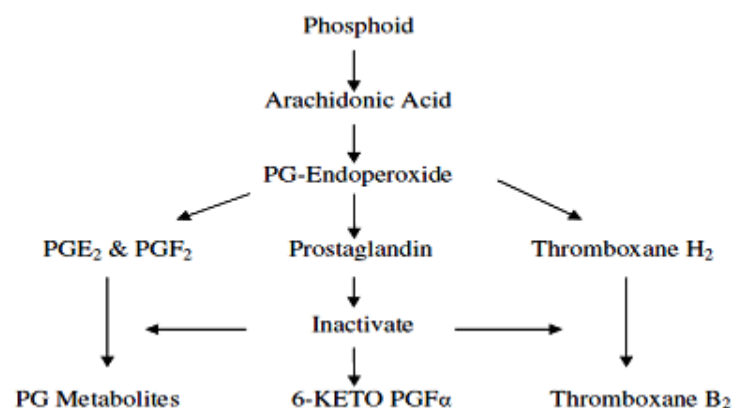


FIG. 2: BIOSYNTHESIS AND METABOLISM OF PROSTAGLANDIN⁴⁸

- **Analgesic activity:** Analgesics are the agents that relieve the sensation of pain without disturbing consciousness or altering other afferent inputs⁴⁹. Analgesic activity was evaluated on the acetic acid induced writhing. The methanolic extract of *Madhuca Indica* 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 extract⁴⁷. In other words if the analgesic drug works the abdominal contraction will be the less in numbers. The analgesic activity of the *Madhuca Indica* can also be evaluated by the using other method of evaluation like tail flick method or hot

plate method in rats^{47, 50, 51}. Significant reduction either in the reaction time hot plate, tail flick, gradient heat, abdominal constriction compared with vehicle treated animals was considered as anti nociceptive response⁵⁰.

- **Antipyretic activity:** *Madhuca Indica* 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 *Madhuca Indica*⁴⁷.
- **Anti-hyperglycemic Activity:** The significant hypoglycemic effects of *Madhuca Indica* 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 *Madhuca Indica* bark to have a hypoglycemic effect on STZ induced diabetic rats⁵². 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^{28, 43}

$$\% \text{ variation of glycaemia} = \frac{G_i - G_t}{G_i} \times 100$$

Where Gi and Gt are the values of initial glycaemia (0hr) and glycamia at 1, 2 and 4 hr respectively.

Methanolic extract of *Madhuca Indica* have significantly decreased the serum glucose level in

streptozotocin and STZ-NIC induced diabetic rats⁵³. The crude methanolic extract of *Madhuca Indica* 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^{54, 55}.

- **Anti ulcer Activity:** Gastro intestinal ulcer is a common disorder of gastrointestinal tract. It is now considered that gastrointestinal ulcer is a disease of multi factorial origin but its detailed etiology is still not clear⁵⁶. Ulcer is a result of the imbalance between the defensive and attacking factors in the GIT. An ulcer is a local defect or excavation of the upper part that is called surface of an organ or the tissue⁵⁷. Anti ulcer activity has been proved in *Madhuca Indica* plant while it is tested in the male vistar rat²⁸. 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.

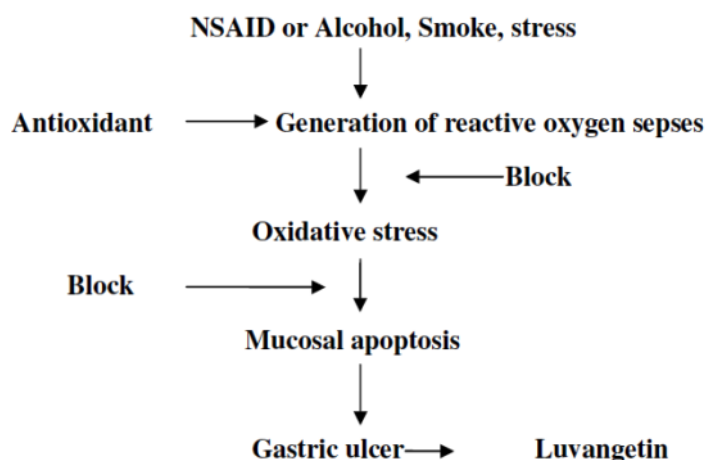


FIG. 3: POSSIBLE MODE OF ANTI ULCER ACTION OF *MADHUCA INDICA*⁵⁶

- **Antioxidant Activity:** Oxidative stress is produced during normal metabolic process in the body as well as induced by a Varsity of environmental and chemical factor, which cause a generation of a various reactive free radical and subsequent change in DNA and lipids^{56, 57}. The reducing

property of ethanolic bark extract of *Madhuca Indica* 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^{52, 58}. 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.

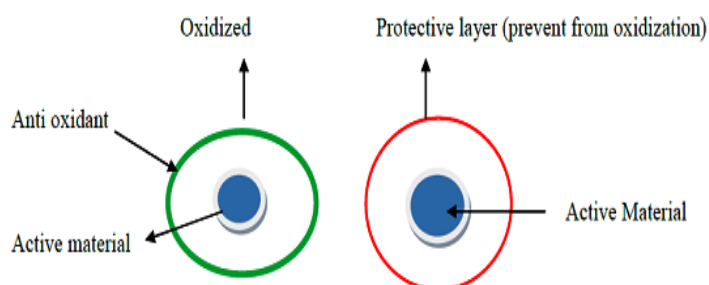


FIGURE 4: POSSIBLE MODE OF ACTION OF ANTIOXIDANT

- **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, 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 spermatogenesis⁵⁹.
- **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 laxative²³.

- **Hepatoprotective Activity:** The methanol extracts of *Madhuca Indica* 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 *Madhuca Indica* 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 *Madhuca Indica* could afford significant dose-dependent protection against CCl₄ induced hepato cellular injury⁶⁰.
- **Antibacterial Activity:** The flower has an antibacterial activity against the *Escherichia coli* and resist against rice pest disease⁶¹.
- **Antiepileptic 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-benzodiazepine 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 group⁶².
- **Anticancer Activity:** In Ayurvedic system of medicine it is stated that the bark of *Madhuca Indica* is useful in the treatment of cancer at the local application⁶³.
- **Toxicity:** Like all word views, it is not entirely without foundation- the safety risk of herbal medicine is generally lower than most of the modern drug⁶⁴. A mixture of saponin isolated from

Madhuca longifolia seed did not reveal any cholinergic activity, although it produced at a higher concentration. The saponin is extremely toxic when administered parentally⁶⁵. L.D. 50 by IP route was one of the same orders as that by the IV route, being 50 to 70 times higher than oral route²³. In the root of *Madhuca Indica*, maximum amount of phenol was observed i.e. 46.0 mg/gdw. These compounds play an important role in the precursor of toxic substance and role in the growth regulation and development of plants⁴⁷. It is also reported to have toxic chemical aflatoxine in *Madhuca Indica* seed oil⁶⁶. The quality control of herbal medicine should be strictly followed to avoid any harmful effect⁶⁷.

CONCLUSION: Plants are the important economical source of a number of well established drugs looking upon wide prospects and potential of *Madhuca Indica* 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 *Madhuca Indica* 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. The research workers have to come along with the people of rulers' area so they may have more and valuable knowledge. In coming next generation the importance of plant and mahua tree is going to be increase because of their effectiveness, easy availability, low cost and comparatively being devoid of toxic effect. *Madhuca Indica* has found several of pharmacological activity, yet several other activities have to be finding out.

ACKNOWLEDGEMENT: I am very thankful to my family for their support and encouragement; I am also thank full of my dear friends Jyoti Sahu, Bhupendra, Monika, Lokesh, for their cooperation and having trust on me during the work of my review.

REFERENCES:

1. Evans WC, Trease and Evans Pharmacognosy. Saunders Publication, Edition 16, 2009:03-04.
2. Hoffman FA, Leaders FE: Botanical (herbal) Medicine in Health Care. Regulatory Perspective Pharm New 1996; 1:23-25.
3. MD Alam Zulfeeqar: Herbal Medicine, APH Publishing Corporation, New Delhi Edition 3, 2008: 11-15
4. Rangari VD: Traditional Drug of India, Pharmacognosy and Phytochemistry, career publication, Nasik, Edition 2, Vol. II, 2009: 01-04.
5. Marilyn Barrett: The Hand Book of Clinically Tested Herbal Remedies, CVS Publisher and distributors, New Delhi, Vol - I, 2007: 03-05
6. Agrawal SS, Paridhavi M: Herbal Drug Technology, Universities Press (India) Hyderabad, Edition 1, 2007: 01-07
7. Ansari SH: Essential of Pharmacognosy, Birla Publication, New Delhi, Edition 2, 2007-08: 575-76
8. Landis Robyn, Khalsa Karta Purakh Singh: Herbal Defense against Illness and Ageing, Thorson publication, New York, Edition 1, 1997: 22.
9. Gupta M, Biswas TK, Saha S: Therapeutic Utilization of Secretary Products of Some Indian Medicinal Plant: Indian Journal of Traditional Knowledge 2006 ; 5 (4): 569-575
10. Cragg GM, Newman DJ and Snader KM: Natural Products in Drug Discovery and Development: Journal Nat prod, 1997; 60: 52-54.
11. Lyle E Craker, James Esimon: Herbs Spice and Medicinal Plants. CBS Publishers and Distributors, Delhi, Edition 1, Vol. III, 2002: 26.
12. Shu YZ: Recent Natural Product Based Drug Development, a Pharmaceutical Industries Perspective. Journal Nat Prod, 1998(61) 1053
13. Heinrich Michael, Barnes Joanne, Gibbons Simon: Fundamental of Pharmacognosy and Phototherapy, Churchill Livingstone Publication, Edition 1, 2004:170.
14. Chopra RN, Nayar SL, Chopra IC: Glossary of Indian Medicinal Plant, National Institute of Science communication and Information resource. CSIR, New Delhi, First Edition.
15. Miller Lucinda G: Herbal Medicinal, A Clinicians guide, Viva Book private Limited, New Delhi, Edition 1, 2005: 2-3.
16. 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
17. Singh Ajay And Singh I.S: Chemical Evaluation of Mahua (*Madhuca Indica*) Seed: food chemistry 1990: 221-228
18. 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
19. Kokate CK, Putohit AP, Ghokhle SB, Pharmacognosy, Nirali Prakashan ,Fourty First Edition, 2008.
20. Bina S Siddiqui, Shazia Khan, M Nadeem Kardar: A New Isoflavone from the *Madhuca latifolia*. Natural Product Research 2010; 24: 76-80.
21. Ross Ivan A: Medicinal Plants of The World, Chemical Constituents, Traditional And Modern Medicinal Use, Humana Press, Totwa, New jersey, Edition 2, Vol-I :01-02
22. Sengar NPS, Agarwal Ritesh Singh: A Text Book of Pharmacognosy, Pharmamed press, Hyderabad, Edition 1, 2009: 44-45.
23. Behl P.N., Sriwasrawa G.S: Herbs Useful In Dermatological Therapy, CBS Publishers and Distributors, New Delhi, Edition 2, 2002:94-95.

24. Variers PS Vaidyarathanam: Indian Medicinal Plants, Orient Longman Publication, New Delhi, Edition 1, Vol.-III, 1995: 362-366.
25. The wealth of India, Raw Material, Council of Scientific and Industrial Research, New Delhi, Vol. 6, 2007.
26. Wyk Ben Erik, Van Wink Michael: Medicinal Plants of The World, Times Editions, Malaysia, Edition 3, 2004: 16-20
27. anandkbhatt.blogspot.com,babelfixbg.net,addithebirde.blogspot.com,commons.wikimedia.org
28. 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
29. Sardana S, Sharma OP: Fundamentals of Pharmacognosy, Birla Publication, Delhi, Edition 1, 2009-10:40-42.
30. Kirtikar KR, Basu BD, Indian Medicinal plants. Lalit Mohan Basu, Allahabad, second Edition.
31. Singh A, Singh IS: Chemical Evaluation of Mahua Seeds. Food Chem 1991, 40: 221-28.
32. Bringi NV, Non-Traditional Oilseed and Oils in India. Oxford & I.B.H. Publishing, 1987: 109-117.
33. Parrota JA: Healing Plants of Peninsular India, CABI Publishing, United Kingdom, First Edition 2001.
34. Brody T: Nutritional Biochemistry, Academic Press San Diego, 1994.
35. Gopalan C, Rama Sastri BV and Balasubramanyam SC: Nutritive Values of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad, India, 2004.
36. Das Basanta Kumar: Identification of Abiotic and Boitic Factors Causing Deterioration during Storage and Development of Storage Techniques for Mahua Flowers. Agriculture Consequetia Scientifica 2010; 75119-125.
37. Benerji DSN, Rajini K, Rao B Srinivasa: Studies on Physico-Chemical and Nutritional Parameter for the Production of Ethanol from mahua Flower Using Saccharomyces Cerevisiae-3090 through Submerged Fermentation. Journal of Microbial and Biochemical Technology 2010; 2:46-50.
38. Shriwastaea RK, Sawarkar SK and Bhutey PG: Decolourization and Deodorizations studies on mahua extract, Res India, 1970; 15:114-117.
39. Shashikant Vilas Ghadge, Raheman Hifjur: Biodiesel Production from Mahua Oil Having High Free Fatty Acid, Science Direct, Biomass and Bioenergy, 2008; 28:601-605.
40. Puhan Sukumar, Vedaraman N., Mahua Oil (*Madhuca Indica* seed oil) Methyl Ester as Biodiesel Preparation and Emission Characteristics. Biomass and Bioenergy 2005; 28:87-93.
41. Khare CP: Rational Western Therapy, Ayurvedic and Other Traditional Usage. Encyclopedia of Indian medicinal plant. Botany. Springer, 2000: 292
42. The Useful Plants of India, Publication and Information Directorate, CSIR, New Delhi, 1986.
43. Dahake Ashok P, S.Chiratan, Antihyperglycemic Activity of Methanolic Extract of *Madhuka Lonifolia* Bark. diabetologia Croatica 2010;39:3-8.
44. Waugh Anne, Grant Allison, Ross and Wilson, Anatomy and Physiology in Health and Illness, Churchill Livingstone, London, Edition 9, 2001: 375-377.
45. Tortora Gerards, Grabowski Sandra Reynolds: Principles of Anatomy and Physiology, John Wiley and Sons, Edition 10, 2003: 777.
46. Tripathi KD: Essential of Medical Pharmacology, Jaypee Brother's Medical Publishers New Delhi, Edition 6, 2008:185.
47. 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.
48. Barar FSK: Essential of Pharmacotherapeutics, S Chand and Company, New Delhi, Edition 1, 1985: 526.
49. Remington: The Science and Practice of Pharmacy, Twenty First Edition, Vol.-2: 1524.
50. 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
51. Chandra Dinesh: Analgesic Effect of Aqueous and Alcohol Extract of *Madhuca Indica* Longifolia. Indian Journal of Pharmacology 2001;33:108-111
52. 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.
53. Kumar Pavan K, Vidyasagar G: Screening of *Madhuca Indica* for Antidiabetic Activity in Streptozotocin and Streptozotocin-Nicotinamide Induced Diabetic Rat. International Journal of Pharma Tech Research 2011, 3:1073-1077.
54. Khan Salehin, Zahan Dilara: Anti hyperglycemic Activity Studies With Methanol Extract of *Madhuca Indica* J.F. Gmel. Leaves and *Paederia Foetida* L. Stems in Mice. Advance in Natural and Applied science 2011,5:122-126
55. 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.
56. Maity Pallab, Hansda Dhananjay, Biological Activity of Crude Extract and Chemical Constituent of Beal. Indian Journal of Experimental Biology, 2009; 47:849-861.
57. Seth SD: Textbook of Pharmacology, Elsevier, Second Edition, 1999.
58. 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
59. Shivabasavaiah, Ram Krishna: Anti fertility Effect of *Madhuca Indica* Leaves in Male Swiss Albino Rats. Journal of Pharmacy Research, 2011, 4:323-326.
60. 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.
61. 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.
62. 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
63. Balachandran Premalata, Govindarajan Rajgopal: Cancer an Ayurvedic Perspective. Pharmacological Research;2005;5:19-30
64. Mills Simon, Bone Kerry: The Essential Guide to Herbal Safety, Elsevier Churchill Livingstone.
65. Alexander Jan, Atli Guojon, Bentord Diana: Saponin In The *Madhuca Longifolia* As Undesirable Substance in Animal Feed. Europien Food Safety Authority 2009;979:1-36
66. Sidhu OP, Chandra Harish, Behl HM: Occurrence of Aflatoxins in Mahua (*Madhuca Indica* Gmel) seeds: Synergic Effect of Plant Extract on Inhibition of Aspergillus Flavus Growth and Aflatoxin Production. Food And Chemical Toxicology, 2009;47: 774-777
67. Liang Yi-Zeng, Xiepeishan Chan Kelvin: Quality Control of Herbal Medicine. Journal of Chromatography 2004; 812: 53-70.