

***Madhuca Lonigfolia* (Sapotaceae): A Review of Its Traditional Uses and Nutritional Properties**

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ABSTRACT: This article discussed various health benefits of *Madhuca longifolia* (. *Madhuca longifolia* (*Mahua*) belongs to the family of *Sapotaceae*. It is widely known as 'Butter nut tree' is a large size tree. It is both wild and cultivated. Mahua flower are used as a food as well as used as an exchanger in tribal and rural areas. Mahua seeds are rich in edible fats so they have economic importance. Mahua fruits are used as vegetable and widely consumed by the tribes of western Odisha. *Madhuca longifolia* is also considered as medicinal herbs and is useful for external application in treating skin diseases, rheumatism, headache, chronic constipation, piles, haemorrhoids and sometimes used as an emetic and galactagogue. Mahua oil is used for manufacturer of laundry soaps and detergent, and also used as cooking oil in various tribal region of India. *Madhuca longifolia* is reported by various scientist that it contain sapogenins, triterpenoids, steroids, saponins, flavonoids and glycosides. The tree is considered a boon by the tribal's who are forest dwellers and keenly conserve this tree. The tribes consider the mahua tree and the mahua drnk as paprt of their cultural heritage. So it is very much necessary to create awareness among the people to conserve the wild forest.

Keywords: butter nut tree, medicinal herbs, mahua, mainstream, sapotaceae

I. INTRODUCTION

Banerji and Mitra, (1996) studied that Mahua (*Madhuca indica* J.F. Gmel. syn. *Madhuca latifolia* Macb.) belonging to the family *Sapotaceae*, is one of those multipurpose forest tree species that provide an answer for the three major Fs i.e. food, fodder and fuel. It is widely distributed in the South Asian countries. Jayasree *et al.*, (1998) find out that, the tree, known under the name of mahua, produces edible flowers and fruits. The leaves of Mahua tree contain saponin, an alkaloid glucoside. Sapogenin and other basic acid have been found in the seeds.. Mahua flowers are well known for their high reducing sugar and nutrient content They are edible and used as a sweetener in preparation of many local dishes like halwa, kheer, puri and burfi (Patel and Naik, 2008) in the mahua production belt of India. However, due to the lack of proper scientific investigation and post harvest processing technologies, they are collected and subjected to open yard sun drying till about 80% moisture is lost, before storage (Patel and Naik, 2008). This process results in heavy microbial load and degrades their food value, finally making them suitable only for the liquor distillation units and as cattle feed. This way a precious, organic and easily available source of natural sugar is being under-utilized. According to Sahay and Singh, (1996) Mahua flowers undergo a series of unit operations before reaching the final step of processing, and the value added products development designs, and fabrication of particular equipments and structures for such unit operations as handling, transport, processing and storage and also for assessing the behaviour of the product quality, require the knowledge of their physical properties. Physical properties of mahua flowers are essential for the design of equipments for drying, cleaning, grading, storage and value added products.

Mahua is a large deciduous tree growing widely under dry tropical and sub tropical climatic conditions. *Madhuca Longifolia* distributed in Andhra Pradesh, Gujarat, Madhya Pradesh, Odisha, Chhatisgad, Jharkhand, Bihar, Uttar Ppradesh. It is an important tree for poor, greatly valued for its flowers and its seeds known as tora. The tree has religious and aesthetic value in the tribal culture. The trees with best girth in forest are often Mahua trees as it is protected and cared by forest dwellers. Mahua tree can be found in forests, revenue, and private land. The early settlers had rights to specific Mahua trees occurring near the village in private, revenue and forestlands. Some trees may even be located at long distance from the village but are recognized as being associated to a family. These rights are only for harvesting flowers but not for fruits and have been practiced. These rights have passed from generation to generation. When father divides the property among his sons, he also divides Mahua tree between them but keeps some for himself till the end, as it becomes an easy source of income. In absence of sons, harvesting rights are given to daughters when they get married. Sometimes villagers of one region, in dearth of Mahua, visit relatives who have trees in abundance.

II. MAHUA FLOWERS AS A SEASONAL GRAIN SUBSTITUTE IN INDIA

In most agricultural communities people rely on seasonal crop production. For many rural people, and especially for the poor, these cycles entail periods of food shortage. It is at these critical periods that the importance of forest foods is greatest. Of course, forests and fallow lands provide food resources in most seasons, in the form of edible leaves, fruits, wild vegetables, roots and tubers and wildlife. But it is at times when few cultivated varieties of food are available-during seasonal shortages and droughts-that forest foods are most appreciated. In southeastern Nigeria, for example, the leaves of the forest trees *Pterocarpus sp.*, *Myrianthus arboreus* and *Ceiba pentandra* are highly valued because they flush at the end of the dry season, providing a vegetable during this "hungry period". Similarly, the fruit of *Treculia africana*, *Chrysophyllum albidum*, and *Dacryodes edulis* is popular since it matures with the early rains during the crop planting season (Okigbo, 1975).

Ogle and Grivetti (1985) conducted one of the most extensive studies of wild food consumption. They found that throughout Swaziland more than 200 species of wild plants are commonly consumed. Wild leaves such as those of *Grewia sp.* are consumed primarily in the spring and summer, while fruits are eaten during the winter and spring when they supply the main source of vitamin C. Other forest/bush foods are also used seasonally, most notably mushrooms, caterpillars and termite larvae. In Upper Shaba, Zaire, women are reported to spend several hours a day collecting mushrooms during the early rainy season (Parent, 1977). The potential of mushroom cultivation as a nutritional component in forestry development efforts has been demonstrated conclusively in successful pilot activities in Bhutan, Thailand and Mexico.

According to Wachiira, (1987) Wild leaves are popular in the rainy season in the Machakos district of Kenya. It has been estimated by a study team that these foods contribute 35 percent by weight to the diet at that time. Fruits are also consumed seasonally, especially by children. *Ximeia caffra* and *Sclerocerva birrea* fruits are so popular that they are found increasingly on farms. In the Kathama area, wild fruits have long been valued as buffer food resources in famines and food shortages.

Campbell, (1986) carried out a study on forest fruit consumption in Zimbabwe revealed that peak collection and consumption of wild fruit do not take place during the main fruiting season, but rather when cultivated food supplies dwindle and requirements for agricultural labour are at their lowest. Thus fruits are consumed when they are most needed rather than when they are most plentiful. Despite the diversity of forest fruits (at least in some regions), the three species *Diospyros mespiliformis*, *Strychnos cocculoides* and *Azanza garckeana* are most popular. They are generally consumed as snacks (by 95 percent of those surveyed), but in some households they are consumed in meals as well. The fruiting season of some fruit-trees, including mangoes, can be easily manipulated and the potential benefits of this type of intervention merit further research. In Zambia's Luangwa valley, Marks (1976) noted that wild foods are important components of the diet, especially during the hunger period. In Mukupu village, for example, in September wild vegetable foods provide ingredients in 42 percent of the meals served (compared with cultivated vegetables, used in only 10 percent of the meals at this time of year). By comparison, in June wild vegetables are used in only 7 percent of the dishes compared to cultivated varieties which at this time feature in more than half the meals.

In many regions hunting is also a seasonal activity, undertaken during the off-peak agricultural season. In the rain forests of Zaire, hunting is at its peak in July and August (the slack period in agriculture), and at its lowest level during the planting season (Mankoto ma Mbalele, 1987). Similarly, in the Boualé region of Côte d'Ivoire, hunting and gathering are at their peak in the agricultural slack period (Blanc-Pamard, 1979).

According to (Getahun, (1974), in Ethiopia, *Pterocarpus sp.* and *Myrianthus sp.* are highly valued for their dry season flushes which provide leaves when few other vegetables are available

According to Ostberg, (1988) in the semi-arid Pokot region of Kenya, *tuyunwo (Balanites aegyptiaca)* is highly valued because it produces during the dry season even in drought years when few foods are available. Trees also provide valued bee fodder for honey production; honey is used to produce the traditionally popular mead drink (Ostberg, 1988).

In India it is estimated that 80 percent of the forest dwellers in Orissa, Bihar, Madhya Pradesh, and Himachal Pradesh depend on forests for 25-50 percent of their annual food requirements (CSE, 1985). These resources are especially important during food hardship periods. Surin and Badhuri (1980) relate that the tribal peoples living in the Chotanagpu plateau depend on forest foods for four to five months when agricultural production is impracticable. Many varieties of mushroom, fruit, leaves, and seeds are consumed. Of particular importance are sal seeds (*Shorea robusta*) which are boiled with mahua flowers (*Mahua-Bassia latifolia*) as a substitute for grain staples.

III. USE AS TRADITIONAL MEDICINE

1. The flowers are used as tonic, analgesic and diuretic, traditionally used as cooling agent, tonic, aphrodisiac, astringent, demulcent and for the treatment of helminths, acute and chronic tonsillitis, pharyngitis as well as bronchitis

- The bark is used for rheumatism, chronic bronchitis, diabetes mellitus, decoction for rheumatism, bleeding and spongy gums. It is a good remedy for itch, swelling, fractures and snake- bite poisoning, internally employed in diabetes mellitus, fruits are astringent and largely employed as a lotion in chronic ulcer, in acute and chronic tonsillitis and pharyngitis.
- Madhuca longifolia* leaves are expectorant and also used for chronic bronchitis, Cushing's disease, verminosis, gastropathy, dipsia, bronchitis, consumption, dermatopathy, rheumatism, cephalgia and hemorrhoids
- The seeds fat has emulsuscent property, used in skin disease, rheumatism, headache, laxative, piles and sometimes as galactogogue.

IV. PHYTOCHEMISTRY OF MAHUA

Flower	Vitamins A and C
Bark	ethylcinnamate, sesquiterene alcohol, α -terpeneol, 3β -monocaprylic ester of eythrodiol and 3β -capryloxy oleanolic acid. α - and β - amyrin acetates
Fruits	α - and β - amyrin acetates
Nut –shell	<i>n</i> -hexacosanol quercetin and dihydroquercetin, β -sitosterol and its 3β -Dglucoside.
Seeds	arachidic, linolelic, oleic, myrisic, palmitic and stearic acids, α -alanine, aspartic acid, cystine, glycine, isoleucine and leucine, lysine, methionine, proline, serine, threonine, myricetin, quercetin, Mi-saponin A & B.
Leaves	β -carotene and xanthophylls; erthrodiol, palmitic acid, myricetin and its 3- O-arabinoside and 3-O-L-rhamnoside, quercetin and its 3-galactoside; 3β -caproxy and 3β -palmitoxy- olean-12-en-28-ol, oleanolic acid, β -sitosterol and its 3-O- β -Dglucoside, stigmasterol, β -sitosterol- β -Dglucoside, <i>n</i> -hexacosanol, 3β -caproxyolcan- 12-en-28-ol, β -carotene, <i>n</i> -octacosanol, sitosterol, quercetin.

V. TRADITIONAL USES OF MADHUCA LONGIFOLIA

Table 1: Traditional Uses Of Madhuca Longifolla

Place, Country	Part(s)	Used Ethno medical	Uses Preparation(s)	Reference(s)
India	Seeds cake	Anti-inflammatory, anti ulcer, and hypoglycaemic activity	Ethanolic & crude alkaloid extract	Seshagiri M. <i>et al</i> 2007
India	Bark	Antidiabetic activity	Methanol, water, & petroleum ether	K Pavan Kumar <i>et al</i> 2011
India	Bark	Antihyperglycemic and antioxidant	Ethanolic extract	Srirangam Prashanth <i>et al</i> 2010
India	Flower	Analgesic activity	Aqueous and alcoholic extracts	Dinesh Chandra <i>et al</i> 2001
India	Leaves & bark	Wound healing activity	Ethanolic extract	Smita Sharma <i>et al</i> 2010
India	Leaves	Nephro and hepato protective activity	Ethanolic extract	S. Palani <i>et al</i> 2010
India	Leaves	Antioxidant activity	Ethanolic extract	S. Palani <i>et al</i> 2010
India	Leaves	Cytotoxic activity	Petroleum ether, chloroform, ethanol acetone and water	Saluja. M.S. <i>et al</i> 2011
India	Bark	Antibacterial activity	Aqueous ethanol, methanol and acetone	Tambekar D.H. <i>et al.</i> 2010
India	Leaves and stem	Antimicrobial activity	Hexane, ethanol chloroform,	Mangesh Khond <i>et al.</i> 2009

	bark		acetone and water	
India	Bark	Antioxidant activity	70% ethanolic extract	Samaresh Pal Roy <i>et al</i> 2010
India	Aerial part	Anti inflammatory, analgesic and antipyretic activity	Methanolic extract	Neha Shekhawat <i>et al.</i> 2010
India	Flowers	Hepatoprotective activity	Methanolic activity	M. Umadevi <i>et al</i> 2011
India	Seeds	Anti inflammatory	Ethanol extract and saponin mixture	Ramchandra D. <i>et al</i> 2009
India	Leaves and stem bark	Astringent, Stimulant, Emollient, Demulcent, Rheumatism, Piles and Nutritive.	ND	Mangesh Khond <i>et al.</i> 2009
India	Leaves	Verminosis, gastropathy, Dipsia, bronchitis, consumption, dermatopathy, rheumatism, cephalgia and hemorrhoids	ND	Y. Vaghasiya <i>et al</i> 2009
India	Bark	Rheumatism, bleeding and spongy gums	Decoction	Tambekar D.H. <i>et al.</i> 2010
India	Bark	Rheumatism, ulcer and tonsillitis	ND	Srirangam Prashanth <i>et al</i> 2010
India	Flower	Skin diseases	Juice	Srirangam Prashanth <i>et. al</i> 2010
India	Seeds	Effective to alleviate pain	Oil	Srirangam Prashanth <i>et al</i> 2010
India	Bark	Itch, swelling, fractures and snake-bite poisoning	ND	K Pavan Kumar <i>et al</i> 2011
India	Leaves	Expectorant, chronic bronchitis and cushing's disease	ND	Saluja. M.S. <i>et al</i> 2011
India	Flowers	Tonic, analgesic and diuretic	ND	Saluja. M.S. <i>et al</i> 2011
India	Flowers	Cure cough	Roasted flowers	S. Palani <i>et al</i> 2010
India	Fruits	Asthma and phthisis	Roasted fruits	S. Palani <i>et al</i> 2010
India	Leaves	Antihyperglycemic activity	Hydroethanolic extract	Rumi Ghosh <i>et al</i> 2009

ND: Not Defined, Yadav Priyanka *et.al* 2012

VI. HEALTH BENEFITS OF MADHUCA

Madhuca has following health benefits:

1. **Bronchitis:** Flowers of Madhuca are used to treat chronic bronchitis problem. Flowers are also used in treatment of cough.
2. **Orchitis (Testis inflammation):** Madhuca leaves are boiled and used for relief from orchitis.

3. **Rheumatism:** A decoction is prepared by boiling bark in water and taken internally to get relief from rheumatism. Oil obtained from seeds can also be applied on the affected areas.
4. **Diabetes:** Bark decoction is proven to be effective for cure of diabetes.
5. **Piles:** Oil extracted from seeds have laxative properties, which helps cure chronic constipation and piles.
6. **Eczema:** Madhuca leaves are effective in treatment of eczema. The leaves coated with sesame oil is heated over fire and applied on the affected area to get relief from eczema.
7. **Gums:** 4 ml of the liquid extract obtained from bark is mixed with 300 ml of water is used as a gargle to get relief from spongy and bleeding gums.
8. **Tonsillitis:** The above preparation is also used for cure of chronic and acute tonsillitis and pharyngitis.
9. **Burns:** Leaves ash is mixed with ghee and is used for cure of scalds and burns. To get relief from itching, bark paste is applied locally.
10. **Lactation:** Madhuca flowers are used to increase the milk production in feeding mothers. Seeds also have the same property.

VII. NUTRITONAL ASPECTS OF MAHUA

1. Mahua flowers:

Table 2: Nutritional Properties Of Mahua

SL.NO	CONSTITUENTS	FLOWER
1.	Moisture (%)	19.8
2.	Protein (%)	6.37
3.	Fat (%)	0.5
4.	Reducing Sugar (%)	50.62
5.	Total Inverts (%)	54.24
6.	Cane Sugar (%)	3.43
7.	Total Sugar (%)	54.06
8.	Ash (%)	4.36
9.	Calcium (%)	8
10.	Phosphorus (%)	2

Source: Kureel R.S et.al, 2009



Fig 1: Traditional Mahua Flowers

Stored quantity of Mahua flowers depends on the need of the family. The poorer the family more is the storage. The storage products are consumed by the tribes in off season.

Usually the tribals do not store these products for long, as they generate earnings to them especially during lean periods secondly Mahua flowers being hygroscopic, absorb atmospheric moisture and get spoiled. The flowers of Mahua tree are fermented to produce an alcoholic drink called Mahua, country liquor. Tribals of Bastar in Chhattisgarh, Odisha. Santhals (Jharkhand) and North Maharashtra consider the tree and Mahua drink as part of their cultural heritage. Tribal men and women both consume this drink and is an obligatory item during celebrations and evening activities. They consumed this liquor in all type of celebrations.

2. MAHUA SEED OIL

Mahua seeds contain about 40% pale yellow semi-solid fat. The seed oil is commonly known as 'Mahua Butter'. The oil content of the seed varied from 33 to 43% weight of the kernel. For the tribals of India,

Mahua oil is by far the most important tree seed oils. Fresh Mahua oil from properly stored seeds is yellow in colour with a not unpleasant taste. The oil is used as cooking oil by most of the tribes in Odisha, Chhattisgarh, and Maharashtra etc.

SL.NO	PROPERTIES	VALUE
1.	Refractive index	1.452-1.462
2.	Saponification value	187-197
3.	Iodine value	55-70
4.	Unsaponifiable matter (%)	1-3
5.	Palmitic C 16:0 (%)	24.5
6.	Stearic Acid C 18:0 (%)	22.7
7.	Oleic Acid C 18:1 (%)	37.0
8.	Linolic Acid C18:2 (%)	14.3

Source: Kureel R.S et.al, 2009



Fig 2: Traditional Mahua seeds

The oil is used for edible and cooking purposes. It is one of the ingredients of hydrogenated Vanaspati. It is also used mainly in the manufacture of soaps, particularly laundry chips. It is also used as illuminant and hair oil, especially in rural parts in the neighborhood of production centers.

VIII. COMMON USES OF MAHUA

1. **Fodder:** Leaves, flowers and fruits are lopped for goats and sheep. Seed cake is also fed to cattle.
2. **Timber:** The heartwood is reddish brown, strong, hard and durable; very heavy (929 kg/cu. m), takes a fine finish. It is used for house construction, naves and felloes of cartwheels, door and window frames
3. **Erosion control:** Mahua has a large spreading superficial root system that holds soil together
4. **Shade or shelter:** The wide spreading crown provides shade for animals. Reclamation: Mahua is planted on wasteland with hard lateritic soils in India.
5. **Nitrogen fixing:** Vesicular-arbuscular mycorrhizal associations and root colonization have been observed in mahua.
6. **Soil improver:** The seed cake has been used as fertilizer
7. **Ornamental:** Mahua is occasionally planted as an avenue tree.
8. **Boundary or barrier or support:** It is planted along the boundaries of fields.
9. **Intercropping:** M. latifolia can be raised with agricultural crops.

IX. CONCLUSION

The study therefore indicates that mahua tree gives significantly high quantity of oil. The oil is rich in PUFA and has desirable level of oleic and stearic acid to be used as cocoa substitute in confectionary products and production of margarines, cosmetic and pharmaceutical industries. The mahua oil also has potential for alternative fuel options for diesel. The flowers are used as vegetable, for making cake, liquor etc. mahua is used to cure Bronchitis, Rheumatism, Diabetes, Piles, Eczema, Gums, Burns etc and flower juice is used in the treatment of various disease and ailments. The seeds are thus valuable in meeting demands for food and food supplements with functional, health-promoting properties in addition to industrial uses. 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 tribal community, 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.

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