



Mahua (*Madhuca indica*) A Multipurpose Tree Species of India: A Review

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Abstract

Madhuca latifolia or *Madhuca indica* commonly called as Mahua is such a kind of tree involved in day to day activity of tribal people. It belongs to the family Sapotaceae, an important economic tree growing throughout India. The Mahua tree is medium sized to large deciduous tree, usually with a short bole and a large rounded crown. It is also called as Butter nut 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. It is also used by wild animals as food. Mahua seeds are rich in edible fats so they have economic importance. Mahua seeds are rich in edible oil so they have economic importance. Mahua fruits are used as vegetable. *Madhuca longifolia* is also considered as medicinal tree and is useful for external application in treating skin diseases, rheumatism, headache, chronic constipation, piles, haemorrhoids and ethno medical properties like antibacterial, anticancer, hepatoprotective, antiulcer, antihyperglycemic, analgesic activities etc. Mahua flower is not only used in preparation of liquor but can also utilized as a food ingredient for preparation of biscuit, cake, laddu, candy, bar, jam jelly, sauces etc. Mahua oil is used for manufacturer of laundry soaps and detergent, and also used as cooking oil in various tribal region of India. 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 drink as part of their cultural heritage. So it is very much necessary to create awareness among the people to conserve the forest.

Keywords: Mahua, flower, oil, tribe and medicinal

Introduction

Nature has blessed us extensively with the wide range of diversified plants used for various purposes like decoration, flowering, fruiting and medicinal, etc. Adoption and utilization of medicinal uses of many plants for commercial purposes have become emerging trend among most of the people and because of that, underutilized plants which are being utilized traditionally have gathered potential focus by researchers and industry people (Pinakin *et al.*, 2018). 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, Chhatisgadh, Jharkhand, Bihar, Rajasthan and Uttar Pradesh. 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 forest lands (Mishra and Sarojini, 2013).

The Mahua trees have large spreading root system, though many of them are superficial. Wood is hard to very hard with large sapwood. Hardwood is reddish brown in colour. It is large and deciduous trees with a short Bole and rounded crown. Mahua has a special status among NTFPs as it is linked to the tribal livelihood systems in different ways. Apart from meeting food and other requirements, it is also an important source of seasonal income (Bisht *et al.*, 2018). It is one of those multipurpose forest tree species that provide an answer for the three major Fs *i.e* food, fodder and fuel (Patel *et al.*, 2011). Fruits are eaten as raw or cooked. The fruit pulp may be utilized as source of sugar, whereas the dry husk makes a good source of alcoholic fermentation. Seeds are good source of oil (Singh *et al.*, 2005). The tree, known under the name of Mahua, produces edible flowers and fruits (Jayasree *et al.*, 1998). 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. Flowers of the plant are edible. The corolla commonly called as Mahua flowers is a rich source of sugar containing appreciable amount of vitamins and minerals (Singh and Singh, 2005). This is a wild plant, generally grown without investing anything; this tree is approximately 20 meters in height and is evergreen or semi-evergreen in nature. It has short, whole and large rounded crown throughout the green forest part of India. Leaves are 10-30 centimetres long, thick, pointed clustered glared near the end of branches. Flowers are small, with a soothing smell, and rich in sugar contents (Johar and Kumar, 2020).

Area and Production

Mahua is a frost resistant species that can grow in marginal areas of dry tropical and subtropical forests up to an altitude of 1200-1800 m, in India. It requires mean annual temperature of 2-46⁰ C, mean annual rainfall ranging from 550-1500 mm and mean annual humidity from 40-90 percent. Mahua trees are distributed from India to other Asian countries like The Philippines, Pakistan, Sri Lanka to Australia. It can be found scattered in pasture lands in central India, and on river banks in semi-evergreen forests. In India, large quantities of Mahua trees are found in the states of Uttar Pradesh, Madhya Pradesh, Orissa, Jharkhand, Chhattisgarh, Andhra Pradesh, Maharashtra, Bihar, West Bengal, Karnataka, Gujarat, Rajasthan and the evaluated annual production of Mahua flowers is 45000 Million tonnes. The yield of Mahua flowers varies from 80-320 kg for every tree. Madhya Pradesh is the most astounding Mahua developing state with average trade volume of 5,730 metric tonnes and worth about Indian rupees 8.4 million (Behera *et al.*, 2016).

Climate and soil

Mahua prefers tropical climate. It can withstand drought admirably. This tree does not survive under waterlogged conditions. Since it is a very hardy tree, it can grow even in pockets of soil between crevices of barren rocks. Trees even grow on degraded rocky areas including salt- affected soils. However, for its better growth and productivity, well drained, deep loam soil is ideal.

Cultivation and collection

This is a wild tree so at present it is not cultivated intentionally and naturally found in nature, but nowadays there is a strong need to cultivate this plant and make necessary changes in its genetic structure to make it more useful for commercial purpose. The application of scientific knowledge and agriculture tools is much needed to make this plant more disease resistant and more flowering along with the enhancement of chemical constituents. The cultivation of Mahua should be done on either wild land for better availability of constituents and its seeds should be spread in the farming areas for the future collection of flower, unripe, and ripe fruits may become easier. Cultivation is generally done in the month of July to September and generally, flowering takes place in March and April. After this time, the flower converts

into fruit which is also useful in both unripe and ripe conditions. Although every part of Mahua plant is useful, flower, fruit, seeds oil, and seed cake are more important (Patel *et al.*, 2019).

Table-1 Constituent present in different parts of Mahua

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

Table-2 Traditional uses of Mahua in India

Plant parts	Medicinal uses	References
Bark	Antidiabetic activity	Kumar and Vidhysagar, 2011
Flower	Analgesic activity	Chandra, 2001
Leaves & bark	Wound healing activity	Sharma <i>et al.</i> , 2010
Leaves	Nephro and hepato protective activity, antioxidant and cytotoxic activity	Palani <i>et al.</i> , 2010
Leaves and stem	Antimicrobial activity	Khond <i>et al.</i> , 2009
Seeds	Effective to alleviate pain	Prashanth and Annsmpelli, 2010
Seed cake	Anti-inflammatory, anti ulcer, and hypoglycaemic activity	Seshagiri and Gaikwad, 2007

Use of Mahua as a Food

Raw consumption of Mahua: In spite of being a rich source of nutrition and easy availability in the rural areas these flowers are not very popular as food. Only a small quantity of flowers is consumed raw, cooked or fried in different parts of India.

Utilization of Mahua for processing of different food products Sugar syrup: Abhyankar and Narayana, 1942 reports on preparation of sugar syrup from dry Mahua flowers, which can be further use as a sweetening agent in different food products.

Jam, Jelly, marmalade, pickle: Reuther *et al.*, 1967 reported that mature (full grown) but still unripe fruits are made into jam with addition of citric acid. The pulp is also converted into marmalade or syrup, which is used as food material. Jelly is also made from the pulp alone or combined with guava to modify the astringent flavour. The pulp is also pickled. Major quantity of flowers is used in the preparation of distilled liquors. Patel, 2008 prepared the Mahua jam and jelly by using fresh flowers. The developed products were tested for their colour, flavour, taste, texture and overall acceptability, using hedonic test. According to the findings of hedonic test all the developed Mahua products were found to be highly acceptable.

Bakery and confectionary: Candy, biscuits and cake were prepared using the Mahua concentrate as a liquid sweetener.

Puree and sauce: Patel, 2008 used fresh flowers and crushed it into puree (after manually removing the stamens) and processed it into sauce.

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 biodiesel. Its fat has been used as substitute for cocoa butter and ghee. It is one of the single largest sources of natural hard fat. 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 lubricants. 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 more. Review of literature based on chemical composition of mahua flower reveals its high nutritional value. Apart from being a rich sours 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 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 Phosphate (Bisht *et al.*, 2018).

Table-3 Nutritional properties of Mahua flower (Source: Kureel *et al.*, 2009)

Constituents	Flower (%)
Moisture	19.8
Protein	6.37
Fat	0.50
Total sugar	54.06
Calcium	8.00
Phosphorus	2.00
Ash	4.36

Tree-Borne Oilseed Mahua

Seeds of many tree species contain high levels of oil and their use for bio-energy generation has been a topic of interest for long (Raina, 1986). Mahua oil is also edible and is used by tribal communities. All the TBOS are multipurpose in their utility, making them what is desired for agroforestry systems. However, caution is necessary in assessing whether all the uses will be realized at the same time.

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. 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.

Other 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) **Shade or shelter:** The wide spreading crown provides shade for animals. Reclamation: Mahua is planted on wasteland with hard lateritic soils in India.
- 4) **Erosion control:** Mahua has a large spreading superficial root system that holds soil together.
- 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:** Mahua can be raised with agricultural crops.

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. Yet due to lack of appropriate knowledge and processing practices this highly nutritious and useful tree is considered as underutilized. So there is a strong need of documentation and conservation of this versatile species for a source of food, medicine and sources of income for poor and tribal population at the time of scarcity.

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Plate-1 Mahua: Multipurpose tree species