

Michelia champaca L. (Swarna Champa): A Review

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ABSTRACT

The present review of *Michelia champaca* L. includes its traditional uses, pharmacological activities and presence of various phytochemicals. The essential oil obtained from the flowers has useful application in perfumery and pharmaceutical industries. The plant is traditionally used for the treatment of fever, colic, leprosy and for curing cough and rheumatism. Bark is stimulant, diuretic and used in fever as febrifuge. Root bark is purgative and emmenagogue used in amenorrhoea. Swarn champa contain various phytochemicals like alkaloids, terpenoids, flavonoids, tannins, steroids, carbohydrates. Pharmacological activities like anti-microbial, anti-oxidant, anti-diabetic, anti-ulcer activities are found to have in this precious plant. It has been reached to endangered level because of the poor germination of seeds either due to its short life or predation by insects, birds and animals. Therefore, micropropagation is in demand for the conservation of this multi-medicinal plant.

Key Words: Anti-diabetic, Anti-microbial, Anti-oxidant, *Michelia champaca* L., Phytochemical

1. INTRODUCTION

Michelia champaca L. belongs to the family Magnoliaceae. The genus is named after Italian botanist Peter A. Michel (1679-1737); the specific epithet after the Hindu name. The plant is tall, evergreen tree with straight stem and smooth brown bark [23][10]. It is native to tropical and subtropical South and Southeast Asia. Occasional trees in low and medium elevation up to 2400m in evergreen forests. It is also cultivated. It has commercial value especially flower whereby the essential oil could be extracted from the flowers and used for production of perfumes, cosmetics and hair oil [9]. It also possesses various pharmacological activities like anti-microbial, anti-oxidant, anti-diabetic, anti-ulcer etc. Flowers, flower buds and fruits are bitter, astringent, acrid, refrigerant, haemostatic, carminative, anthelmintic, diuretic etc. The stem bark is febrifuge, stimulant, expectorant and is useful in chronic gastritis, fever, cough, bronchitis and cardiac debility. Root and root bark are purgative and emmenagogue and are useful in the treatment of constipation, amenorrhoea and dysmenorrhoea.

2. SYNONYMS

Table 1: Synonyms of *Michelia champaca* L.

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| <i>Magnolia champaca</i> (L.) Baill. ex Pierre |
| <i>Champaca michelia</i> Noronha |
| <i>Sampacca suaveolens</i> (Pers.) Kuntze |
| <i>Michelia blumei</i> Steud. |
| <i>Magnolia membranacea</i> P.Parm. |

3. COMMON NAMES

Table 2. Common names of *Michelia champaca* L. in different languages.

| Language | Common Names |
|----------|--|
| Sanskrit | Champeya, Champaka, Hempushpa, Kanchana, Shat, Latika, Deeppushpa etc. |
| Hindi | Champa, Swarna champa, Kanak champa |

| | |
|-----------|--|
| Bengali | Sorno champa |
| Gujarati | Rae-champo |
| Tamil | Chambugam, sempangan, chembuga |
| Kannada | Sampige |
| Telugu | Sampangi |
| Malayalam | Chenbagam |
| English | Golden champa, Yellow champa, Fragrant champaca, Orange chempaka |

4. CHARACTERISTICS OF GENUS – *Michelia* Linn.

The generic name has been assigned in the honour of P.A. Micheli, a famous Florentine botanist. The genus comprises of handsome trees. The leaves are alternate and simple, entire; stipules conspicuous. The flowers are axillary or terminal, trimerous and often large. The sepals and petals are usually similar and deciduous. The stamens are free and carpels are indefinite, style is usually short. Fruits are of follicular carpels.

5. BOTANICAL DESCRIPTION

Michelia champaca L. is an evergreen or semi-deciduous, graceful, small to medium sized tree up to 50 m tall; bole straight, cylindrical, up to 200 cm in diameter, without buttresses; bark surface smooth, grey to greyish-white, inner bark fibrous, yellow to brown, crown conical to cylindrical; branchlets terete with annular scars of caducous stipules, glabrous, apical bud covered by sericeous lanceolate stipules; leaves are simple, entire, arranged spirally, lamina elliptic-lanceolate, apex acuminate with twisted acumen, base acute to attenuate, margins slightly undulate, glabrous, chartaceous, midrib nearly flat above, secondary nerves 12-16 pairs; stipules adnate to or free from the petiole; flowers on short, axillary brachyblast, solitary or rarely in pairs, large, tepals 6-21, in 3-6 usually subequal whorls, pale-yellow with strong odour; stamens many, anthers with a short to prominently elongated connective; gynoecium stipitate with spirally arranged, free or connate carpels containing many ovules; fruiting carpels dehiscent along the dorsal suture when free or fused and forming a fleshy or woody syncarp; seed hanging from its funicle, brown and 1-4 in fruit. Flowering is during summer season, chiefly in April and fruiting in winter season.

6. CHEMICAL CONSTITUENTS

The essential oil isolated from flower, leaf and fruit contain mono and sesquiterpenes. The plant also contains sitosterol and its glucoside, parthanolide, dihydroparthenolide, micheliolide, germacranolide, constinolide, iriodenine, macheline, A, urshinsunine, oxoushinsunine and magnoflorine.

7. PRODUCTS

Leaves are fed to silkworms as fodder. The tree is used as fuel wood. Heartwood, olive-brown turning to dark brown with a greenish tinge upon exposure, is clearly differentiated from the pale brown, up to 8 cm wide sapwood. Grain straight or slightly interlocked, texture fine to moderately fine and even. *Michelia* wood is nicely figured and is used for furniture, cabinetwork, carvings, turnery and pattern making; it has also been used for cement-bonded wood-wool board. In India it has been recommended to ring girdle trees about 3 years before felling to prevent possible warping and checking of the wood. Flowers yield an essential oil which is used as an anti-depressant and said to soothe and relax the body and strengthen the mind. It is widely used in perfumery industry for its dark aroma to create very exotic scents. It is also used in massage therapy to support healthy joints and muscles. Analyses of seeds showed low (20%) kernel contents but high oil contents of kernel (32.2%) and 6.44% of seed. It has potential for commercial exploitation for oil production for various uses. Leaf extract is toxic to the rice fungus, *Pyricularia oryzae*. Fatty oils extracted from the seeds show antibacterial activity against *Bacillus pumilus*, *B. subtilis*, *Salmonella typhosa*, *S. paratyphi*, *Micrococcus pyogenes* var. *albus* and *Staphylococcus aureus*. Soil under tree cover shows an increase in pH, soil organic carbon and available phosphorus.

8. MEDICINAL AND ETHNOBOTANICAL USES

The essential oil obtained from the flowers has useful application in perfumery and pharmaceutical industries. The plant is traditionally used for the treatment of fever, colic, leprosy and cure for coughs and rheumatism and for remedies of various disorders [13][20][22][1]. A decoction of the bark and leaves is given after childbirth; the bark is used as a febrifuge. According to Indian Medicinal Plants, Root and root bark of *Michelia champaca* are purgative and emmenagogue and are useful in the treatment of abscesses, inflammation, constipation, amenorrhoea and dysmenorrhoea. The stem bark is astringent, febrifuge, diuretic, stimulant and expectorant and is useful in chronic gastritis, fever, strangury, cough, bronchitis and cardiac debility. Flower, flower buds and fruits are bitter, astringent, acrid, refrigerant, haemostatic, digestive, carminative, depurative, digestive, anthelmintic, diuretic, expectorant,

cardiotonic, stimulant, stomachic and antipyretic. They are useful in nausea, burning sensation, haemolysis, skin diseases, leprosy and ulcers, gout, cough, bronchitis, dysmenorrhoea, strangury, malarial fever. The fruits are used in dyspepsia and renal diseases [2] and are applied for healing cracked feet. According to Ambasta [4] bark is also chewed with beetel as stimulant. Nadkarni [11] stated that young leaves contused and macerated in water and instilled into the eyes to clear the vision. The bark of the root is used as adulterant of cinnamon [4].

9. PHYTOCHEMICAL SCREENING

Phytochemical screening of various extracts of *Michelia champaca* L. was studied by Kodongala [21]. The phytochemical test reveals the presence of Triterpenoids and Steroids in petroleum ether extract and absence of Alkaloids, Carbohydrates, Flavanoids, Glycosides, Resins, Saponins and Tanins in all extracts. Further, Geetha [12] investigated the preliminary Pharmacognostical study on leaves and flowers of *Michelia champaca* L. in which they performed the preliminary phytochemical screening. The results showed the presence of alkaloids, saponins, tannins, glycosides, carbohydrates, amino acids, flavonoids and sterols in both leaves and flowers. Extracts used were acetone, ethanol, petroleum ether, chloroform and aqueous. These all detailed results are shown in Table 3.

Table 3: Phytochemicals present in plant parts of *Michelia champaca* L.

| Plant part used | Extracts used | Phytochemicals present |
|-----------------|-----------------|---|
| Stem bark | Petroleum ether | Triterpenoids, Steroids |
| | Diethyl ether | Alkaloids |
| | Ethyl acetate | Glycosides |
| Leaf | Acetone | Alkaloids, Glycosides, Amino acids |
| | Ethanol | Alkaloids, Glycosides, Carbohydrates, Amino acids, Flavanoids |
| | Aqueous | Tannins, Amino acids, Flavanoids |
| | Benzene | Sterols |
| | Chloroform | Alkaloids, Glycosides, Amino acids, Sterols |
| | Petroleum Ether | Sterols |
| | Flower | Acetone |
| | Ethanol | Alkaloids, Tannins, Glycosides, Carbohydrates, Amino acids, Flavanoids, Sterols |
| | Aqueous | Tannins, Amino acids, Flavanoids |
| | Benzene | Alkaloids, Sterols |
| | Chloroform | Alkaloids, Glycosides, Amino acids, Sterols |
| | Petroleum ether | Alkaloids, Sterols |

10. BIOLOGICAL ACTIVITIES

- A. Anti-diabetic activity:** The ethanolic extract of *M. champaca* L. exhibited significant anti-hyperglycemic activity but did not produce hypoglycemia in fasted normal rats. Apart from this extract, the crude aqueous and petroleum ether extracts were found active only at the end of the first hour. This study supports the traditional claim and the ethanolic extract of this plant could be added in traditional preparations for the ailment of various diabetes-associated complications [7].
- B. Anti-microbial activity:** Khan [14] studied the antibacterial activity of methanolic extract of leaves, seeds, stem and root bark. Obtained fractions exhibited a broad spectrum of antibacterial activity. Kumar [19] investigated that methanolic extract of leaves, seeds, bark exhibited a broad spectrum of anti-bacterial activity. The methanolic, ethanolic and aqueous extracts of flowers shown antimicrobial activities on *S. aureus* ATCC 25922 and *B. subtilis* ATCC 6633, which are gram positive bacteria.
- C. Anti-oxidant activity:** Kumar [19] performed the anti-oxidant activity of various extracts of *Michelia champaca* L. flowers i.e. petroleum ether, benzene, chloroform, ethanol, methanol and aqueous extracts. Three complementary test systems, namely DPPH free radical-scavenging, reducing power method and total flavonoid concentration, were used for this analysis. It was observed that in line with the increase seen in the amount of ethanol, methanol, aqueous and standard, an increase in the DPPH free radical scavenging occurred. The reducing power and total flavonoid concentration of methanolic extract of the *Michelia champaca* L. was high as compared to the other extracts. Further Ananthi and Chitra [25] investigated the antioxidant activity of

Methanolic extract of *Michelia champaca* L. This extract of the plant showed effective free radical scavenging activity at 300 μ g concentration.

- D. Anti-ulcer activity:** Kumar [15] studied anti-ulcer activity of *Michelia champaca* L. Anti-ulcerogenic activity of leaves and flowers are evaluated against aspirin induced gastric ulcers in pylorus ligated rats. The anti-ulcer potential is determined by using gastric juice volume, total acidity, pH and ulcer index. Both aqueous and alcoholic extracts of *Michelia champaca* L. flower and leaves are evaluated for their anti-ulcer potential at about a dose of 300mg/kg b.wt, and are compared with the standard drug Crimitidinen(50mg/kg b.wt). All the four extracts are said to possess significant anti-ulcer potential by decrease in gastric juice volume, total acidity, ulcer index and increase in pH.
- E. Diuretic Activity:** Ahmed [8] studied the diuretic potential of the leaves and stem bark of *Michelia champaca* L. The most promising diuretic potential of the four test doses as evidenced from the present study was found to be the 500 mg/kg dose of *M. champaca* stem bark aqueous extract, both in terms of urinary electrolyte concentration as well as urinary volume excreted. Amongst the two test doses of the leaves extract, the higher dose afforded better results for urinary electrolyte concentrations. However both the lower doses of leaves as well as stem bark could not approximate the electrolyte concentrations of the standard drug Furosemide and were also insignificant as compared to the control group.

11. MICROPROPAGATION

Micropropagation of *Michelia champaca* L. is in demand due to its low rate of seed germination. It is become endangered due to this reason. Some of the works of micropropagation of *Michelia champaca* L. are as: Callus induction and plant regeneration of *Michelia champaca* L. was studied by Abdelmageed [3]. Callus and shoot was induced on MS basal media supplemented with different concentrations of IAA, 2, 4-D and BAP after two weeks of culture. 2, 4-D gave the highest yield of callus formation followed by IAA and BAP. Further, Establishment of plant regeneration of *Michelia champaca* L. through cell suspension culture was studied by Armiyanti [1]. Liquid Murashige and Skoog medium containing 2 mgL⁻¹ α -naphthaleneacetic acids induced high frequency of somatic embryos. Callus induction of *Michelia champaca* L. through petiole was observed by Shukla [24]. The study of effect of B₅ medium supplemented with different concentration of 2, 4-D (0.2mg/l, 4.0mg/l, 6.0mg/l and 8.0mg/l) was found best suitable result for callus induction from petiole of *Michelia champaca* L.

CONCLUSION

The extensive literature survey of *Michelia champaca* L. revealed that it is important commercial and medicinal plant. It has high economic value. It is proved that it has various phytochemicals with several biological activities. This tree has properties like anti-oxidant, anti-microbial, anti-diabetic etc. But due to low survival rate of its seeds, this tree is becoming endangered in some parts of India. Therefore, there is a need to work on its tissue culture, so that we can increase their number and use it for the betterment of the mankind.

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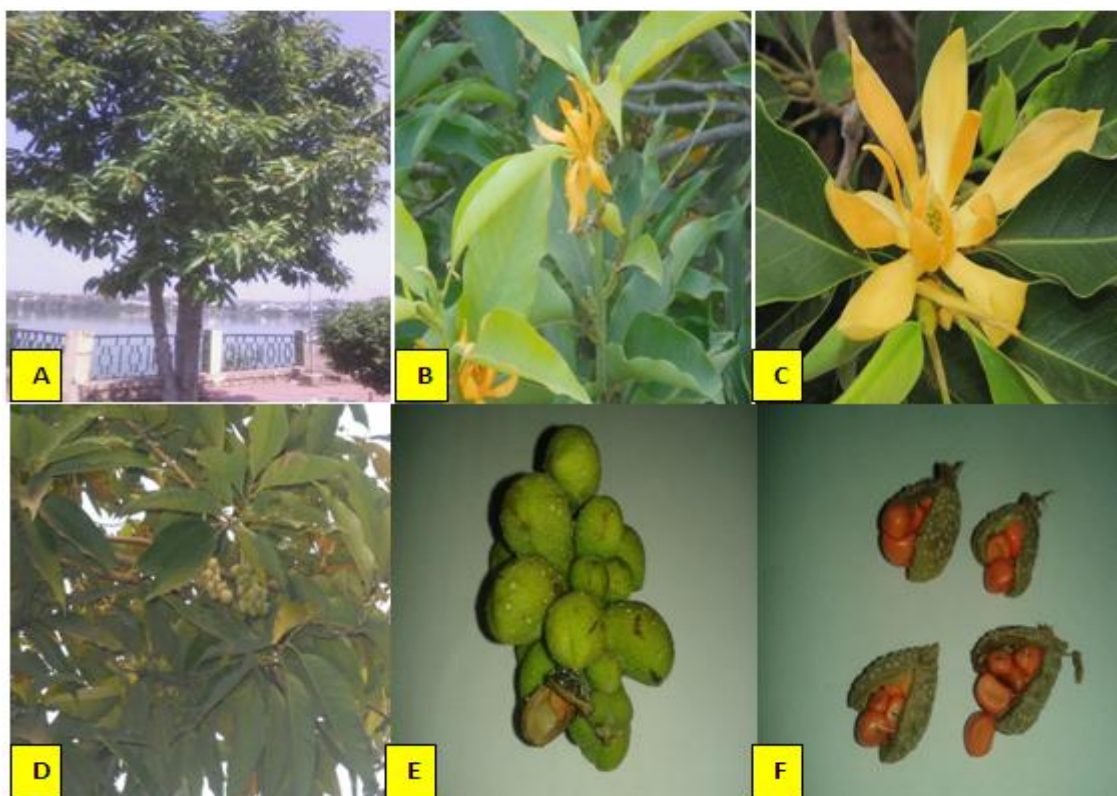


Figure 1: A. Mature plant of *Michelia champaca* L. B. Flowering twig C. Enlarged view of flower D. Fruiting twig E. Bunch of fruits F. Mature seeds coming out from fruits.