A REVIEW ON PHYTOCHEMICAL AND PHARMACOLOGICAL PROPERTIES OF MICHELIA CHAMPACA LINN. FAMILY: MAGNOLIACEAE

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ABSTRACT: Michelia Champaca Linn., belonging to family Magnoliaceae, is commonly known as Champa. It is a medium size evergreen tree highly distributed in eastern Sub-Himalayan tract, West Bengal, Mayanmar and South India in addition to China. This plant is useful either as ornamental purpose or as traditional ethanomedicine. Now, the purpose of this article is to describe the pharmacognostic, pharmacological and chromatographic profile of this plant. This article provide the collective information about the phytochemical constituents isolated from various parts of this plant used in modern scenario for the treatment of various ailments like β-sitosterol, sesquiterpenes, parthenolide, dihydroparthenolide, gallic acid, quercetine, liriodenine, essential oils, starch etc. Traditional uses of plant in the treatment of various disease like rheumatism, gout, diuretic, febrifuge etc. This article also give information about reported pharmacological activities such as anti-diabetic, anti-microbial, anti-inflammatory, diuretic, anti-ulcer, analgesic, burn wound healing, anti-helmintholytic, Procognitive activity, anti-oxidant and some other activities.

INTRODUCTION: M. champaca Linn. belonging to family (Magnoliaceae) is an evergreen plant mainly cultivated in Indian gardens and near temples for its fragrant flowers and handsome foliage. In traditional system of medicines, plants are the primary source for the treatment of various ailments. Michelia is the genus consisting of 80 species distributed throughout the tropical and subtropical region and of which about 70 species are native to China and found in southwestern and eastern mountainous region. One of these 80 species, M. champaca which is commonly known as Champa in Hindi; Champaka in Bengali; Atigandhaka in Sanskrit. It is highly distributed in Sub-Himalayan tract and in Assam, Western Ghats, South India, Burma-Yunnan, Indo-China, Siam, Malaya. Different parts of plant have medicinal importance in various ailments. Its flowers are used traditionally as bitter, demulcent, anti-pyretic, anti-emetic, diuretic, scabies and in gonorrhea; fruits in the treatment of dyspepsia and in renal disease; seeds in healing of crack feet whereas roots are employed in the treatment of menstruation disorders.

This plant possess the yellow to orange color flowers with strong fragrance. Leaves and root bark contain parthenolide and stem bark contain michampanolide, 8-acetoxyparthenolide, magnograndiolide, costunolide, dihydroparthenolide, β-sitosterol, liriodenine, ushinsunine, magnoflorine and micheliolide from root bark. This plant possess the various pharmacological activities like anti-diuretic, anti-diabetic, anti-microbial, anti-ulcer etc.
Botanical Description: *M. champaca* family *Magnoliaceae* is a tall, handsome and evergreen tree having straight trunk, ascending branches, spreading, with closed head \(^2\). It is medium sized tree about 50 cm in height and the stem bark is bole straight, cylindrical about 200 cm in diameter. Bark is smooth, grey to greyish white externally and yellowish brown internally, fibrous and crown is conical to cylindrical \(^16\). Leaves are acuminate, lanceolate; Blade-20.3-25.4cm long and 3.7-10.2 cm wide, entire, glabrous above and more or less beneath. Petioles are 18-25 mm long \(^3-4\). Plant possess wide yellow or orange colored flowers, with strong fragrance about 2.5-5.1 cm in diameter, 15 petals, carpels densely packed on sessile gynophore, about 1-4 seeds of brown color are present inside the fruit \(^5\) as shown in Fig.1.

![Fig.1: Picture of Plant](image)

**FIG. 1: PICTURE OF PLANT**

Geographical Distribution:
*M. champaca* is native to temperate Himalayan region and is distributed throughout the subtropical and tropical countries such as India, South China, Indonesia, Philippines and some Pacific Islands \(^17\). Including Taiwan, Malaysia, Vietnam, Sumatra and in India, it is highly distributed in Eastern Himalayan tract and lower hills up to 3000 ft., Assam, Myanmar, Western Ghats, South India and Bangladesh, Arunachal Pradesh, Bihar \(^18-20\).

Ecology:
*M. champaca* is well grown in moist, deep and fertile soil and is found scattered in primary lowland in rain forest, up to 2100 m altitude at absolute maximum temperature 35-40°C and minimum temperature 3-10°C \(^21\). The growing season for this plant mainly is monsoon during June to September \(^22\). This Plant is rich in volatile oil constituents, concentration of which very due to seasonal variation like sesquiterpene content are found be constant in concentration during January, March, May, July, December about (5-7%) and 21% in September and terpenoid derivatives like aliphatic C\(_{15}\) and C\(_{16}\) alcohol have constant amount (14-17%) all over the year \(^23\).

Synonyms:
Two synonyms of *M. champaca* Linn \(^24\) are mentioned below:
*M. Pilifera* Bakh. F; *M. Velutina* BL.

Vernacular Names:
*M. champaca* is also known by various local names as given below \(^3\):

- **Assam**: Phulchopa, Phulsopa;
- **Bengal**: Champa, Champaka;
- **Bombay**: Champa; **English**: Golden champa, Yellow champa;
- **Gujerati**: Champa, Sonchampa;
- **Hindi**: Champ, Champa, Champaca, Champac;
- **Kathiawar**: Pilochampo, Sonchampo;
- **Konkani**: Champa, Champo;
- **Marathi**: Kudchampa, Sonchampa;
- **Punjabi**: Champa, Chamoti;
- **Sanskrit**: Anjana, Atigandhaka, Hempushpa, Kanchana;
- **Tamil**: Amariyam, Sambagam;
- **Telugu**: Champakmu ; **Uriya**: Champa, Chamoka.

Taxonomy Classification:
Plant is taxonomically classified \(^25\) as given below:

- **Kingdom**: Plantae
- **Subkingdom**: Tracheobionta
- **Division**: Magnoliophyta
- **Class**: Magnoliopsida
- **Subclass**: Magnoliidae
- **Order**: Magnoliales
- **Family**: Magnoliaceae
- **Genus**: Michelia
- **Species**: *Michelia champaca*
Identity, Purity & Strength:
There are certain standardized parameters (Table 1) which help in the identification of this plant either in strength and purity 26.

TABLE 1: STANDARDIZED PARAMETERS OF M. CHAMPACA LINN.

<table>
<thead>
<tr>
<th>Standardized parameters</th>
<th>Value (% W/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign matter</td>
<td>Not more than 2</td>
</tr>
<tr>
<td>Total Ash</td>
<td>Not more than 11</td>
</tr>
<tr>
<td>Acid-insoluble ash</td>
<td>Not more than 1.5</td>
</tr>
<tr>
<td>Alcohol-soluble extractive</td>
<td>Not less than 9</td>
</tr>
<tr>
<td>Water-soluble extractive</td>
<td>Not less than 12</td>
</tr>
</tbody>
</table>

Ayurvedic Preparations:
M. champaca is widely practiced in Ayurvedic system of medicine and its various formulations like Candanabalalaksadi Taila, Baladhatryadi Taila, Pushpa churna are available in the market 26.

TLC and HPTLC of constituents from m. Champaca:
TLC of β-Sitosterol: TLC of methanolic extract of leaves and stem bark of M. champaca is carried out by using three different solvent systems.

HPTLC of Gallic acid: HPTLC of Gallic acids is carried out to identify the quantity of gallic acid in leaves and stem-bark by using reference standard of gallic acid and by preparing the serial dilution (200 to 1000 µg Ml⁻¹) and then detected at 254 nm in UV apparatus and calculate the concentration in test samples. Results show the presence 736.963 and 595.287 µg Ml⁻¹ for leaves and stem-bark respectively, amounting to 73.696 and 59.287 mg/g in drug sample. Leaves are the richest source of Gallic acid 28.

HPTLC of Quercetin: HPTLC of quercetin is carried out to check its concentration in n-hexane extract of leave and stem-bark in M. champaca by preparing the serial dilution of reference standard (200 to 1000 µg Ml⁻¹) and then detected at 366 nm result shows the amount are 682.235 and 498.158 µg Ml⁻¹ for leaves and stem-bark respectively, amounting to 68.223 and 49.851 mg/g in drug sample 29.

Phytochemistry:
Numerous active principles and secondary metabolites (Fig. 2) have been isolated from various parts of M. champaca. Phytochemical studies on stem bark shows the presence of triterpenoids, steroids, fatty acid 4 and other studies revealed the presence of sesquiterpene lactones, alkaloids, flavonoids, tannins and saponins in leaves, stems and roots of M. champaca 6, 12, 30-31. Michelia champaca reported to contain liriodenine, parthenolide and guainanolides 32-35. Volatile oil have been isolated from the leaves of M. champaca containing compounds like benzyl acetate, linalool, isoeugenol 36. Stem bark contains michampanolide, 8 - acetoxyparthenolide, magnograndiolide, costunolide, dihydroparthenolide, β-sitosterol, ushinsunine, magnoflorine and micheliolide from root bark 1, 5-8. The are some aporphine compounds like compound like (-)-anonaine 37, (-) - asimilobine, (-) - romerine, (-) - N-acetylanonaine 38, (-) - nuciferine 39, (-)-anolobine 40; lignan – syringaresinol 1; amide- N trans-feruloyltaryamine 41 and scopoletin 42; valinone 43; vanillic acid 37 are isolated from the branches 44. There are some other constituents have been isolated from stem bark of M. champaca like 3β-16α-dihydroxy-5-cholesteryl-21-al, n-docosanoic acid and stigmasterol 16; Polyphenolic compounds like gallic acid from the stem bark 28; quercetin from stem bark and leaves of M. champaca 29. Bark also contain volatile oil, essential oil, fixed oil, resin, tannin, mucilage, starch, sugar 32.
Traditional Uses:
The different parts of plant *M. champaca* have been used in the treatment of various disease traditionally like stem bark is used in the treatment of eye disorders, inflammation, antidote for scorpion and snake venoms, cough, gonorrhoea. It is commonly used in traditional medicine for the treatment of stomach ulcer and as diuretic. It is also useful in cephalgia, ophthalmia, gout and rheumatism. Traditionally it is used as disinfectant, astringent, diuretic, cooling property, parasitic infection and disease due to vitiated blood. It is also used for fever, colic, leprosy, post partum protection, in child birth and as febrifuge.

Uses of different parts of plant:
Plant has fragrant flowers therefore it is grown near the temples and churches. These are used as stimulant, expectorant, in rheumatism (Uuani), to treat the bilious condition. These are used for in India for the extraction of essential oil and as hair adornment. Leaves are used to remove the foetid odour of vaginal discharge in combination with other drugs. Stem-Bark is used in gastritis, fever and cough and root bark is used in the treatment of inflammation, constipation and dysmenorrhoea.

Pharmacological activities:
*M. champaca* possesses large number of reported activities given as mentioned below:

Diuretic activity:
Traditionally, *M. champaca* is used in ethanomedicine as diuretic agent. In traditional system of medicine this plant is used in the form of aq. extract of leaves and stem bark as diuretic. This plant possesses diuretic activity at dose of 250 and 500 mg/kg in adult Swiss albino Wister rats with higher dose exhibit more promising responses. Aq. Extract of stem possesses much diuretic activity as compare to leaves. It is also used in other kidney disease and in dysuria.

Anti-microbial activity: *M. champaca* possess anti-microbial activity with methanolic extract of leaves, seed, stem, root bark, stem, root heart-wood and activity is increased after fractionization (petrol, dichloromethane, ethyl acetate, butanol). Fractionation leads to broad spectrum antibacterial activity in all fraction of stem bark and dichloromethane fraction of root bark. It also possess antifungal activity. Liriodenine is the active constituent in plant responsible for antimicrobial activity.

Anti-ulcer activity: *M. champaca* Linn. flower and leaves aq. and alcoholic extract shows the anti-ulcer activity at dose of 300 g/kg in male albino rats. It causes the decrease in gastric juice, total acidity, ulcer index and increase in pH. It decreases the acid and pepsin outputs which are required to maintain the gastric mucosal strength.

Anti-diabetic activity: *M. champaca* Linn. flower buds possess the anti-diabetic activity at doses of 200 and 400 mg/kg in Wistar rats but unable to produce hypoglycemic activity in fasted normal rats. Aqueous and petroleum ether extracts also show some hypoglycemic activity but only at the end of first hr. Only ethanolic extract is effective to elevate the biochemical parameters. Leaves of this plant also exhibited the anti-hyperglycemic activity at dose of 200 mg/kg in diabetic rats.

Anti-inflammatory activity: Flower methanolic extract at dose 100 mg/kg of *M. champaca* produces anti-inflammatory action against Cotton pellet granuloma rats.

Burn wound healing activity: *M. champaca* Linn. flowers ethanol extract at dose of 100 mg/kg possess the burn wound healing activity in Wistar rats. It shows improvement in wound healing either by oral and tropical administration. It is useful in the treatment of burn wounds in immunocompromised patient.

Anti-oxidant activity: *M. champaca* Linn. leaf methanol extract possess the DPPH free radical scavenging activity at dose of 0.1 ml of plant extract in 3 ml of 0.004% methanol solution of DPPH. Activity of extract increases with increase in dose.

Analgesic activity: *M. champaca* Linn. Leaves methanol extract at dose of 200 and 400 mg/kg exhibited the analgesic activity in acetic acid induced writhing model. The action of extract increases with increase in dose.
Helmintholytic Activity: Methanolic and aqueous extracts of *M. champaca* Linn. Leaves at doses of 30 g/ml and 70 mg/ml in earth worms showed significant paralysis and death time which is much more as compare to albendazole 44.

**Procognitive activity:** *M. champaca* Linn. leaf hexane extract at dose of 100 and 200 mg/kg exhibited procognitive activity in memory deficit mice using rectangular maze and Y maze (interceptive behavioral models). The activity of extract increased with increased in dose. Higher dose leads to memory enhancing and as a result, better learning enhancement is recognized in mice 55.

**Anti-cancer:** The compound liriodenine which have been isolated from the branches of *Michelia champaca* shows the anti-cancer activity. It shows the inhibition action on MDA-MB-231 human breast adenocarcinoma Cells and A549 human lung adenocarcinoma cell. It shows its maximum inhibition action with 20 μm in 48 hrs 44.

**Other activities:** The plant *M. champaca* also exhibited some other activities helpful in the treatment of various diseases like Flowers of this plant have been taken through oral rout in stomachache, as carminative and to treat the dyspepsia 56. In siddha system of medicine, flower oil of *M. champaca* is used in the treatment of joint swelling 57. Seed of plant are eaten to improve the appetite and in liver disorders 58. Leaves infusion are used in the treatment of colic with honey and paste of fruits and seeds is used in treating the cracks of feet 59.

**CONCLUSION:** Traditional natural remedies are used all over the world due to low cost, safety and due to lack of side effects. *M. champaca* is an ethnopharmacology found to be traditional healer in the treatment of various diseases in Ayurveda and Unani system of medicines. Traditionally, it is useful as anti-diabetic, anti-oxidant, anti-microbial, emmenogogue, and in menstrual disorders. Present review provides the composite information on this plant and it seems that it act as curative tool for ailments due to various constituents. Further investigation on this plant may be helpful in the prevention of other diseases in future by preparing formulations in combination with other drugs.

**REFERENCES:**


