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Medicinally important plants of Menispermaceae family

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Abstract: Plants are considered a great source of various herbal medicines, which have been useful in the treatment of various ailments and diseases. A great contribution of plant-based materials in the pharmaceutical field results in the growing interest in the exploitation of indigenous medicinal plants to make a potential medicine. Several potent plant families are broadly investigated throughout the world, including the family of Menispermaceae, comprising about 72 genera and 526 species. Chemically, it contained some important secondary metabolites such as glycosides, flavonoids, alkaloids, triterpenoids, etc. These compounds play an important role against many lethal diseases and possess anti-inflammatory, diuretic, anti-oxidant, and analgesic activities. Some important plants belonging to this family are used to treat skin diseases, coughs, wounds, diarrhea, etc. This medicinal importance attracted the researchers to explore the various aspects of this family. The present review highlights some ethnobotanical significance.

Keywords*:* Menispermaceae, Ethnobotany, Medicinal plants, Traditional knowledge

Introduction

The Menispermaceae family of flowering plants, comprises of about 72 genera and 526 species (Ribeiro et al., 2023). Most of the members in this family are climbing plants, rarely trees, shrubs, or herbs, and found in the tropics, but a few are found in temperate regions (*i.e.,* all *Menispermum* L. and *Cocculus*

DC. species). A number of plants belonging to this family are medicinally important, being used in the traditional medicines throughout the world (Ortiz et al., 2007; Jahan et al., 2010). They play a large role in many aspects of tropical forests, and its importance may be increasing with global climate change (Schnitzer and Bongers, 2002; Phillips et al., 2002). Menispermaceae members are traditionally known as the "moonseed family", its ethnobotanical uses range from arrow poisons (curare) to medicinal plants. Their pharmacological activities include antioxidant, bronchodilator, anti-inflammatory, hyperglycemia, cardiopathy, and many of them are associated with the presence of alkaloids, and other constituents such as pectins, flavonoids alkamides, and essential oils (Ribeiro et al., 2023). The morphological delimitation in this genus is very complex, which has resulted in confusing species with each other and with other genera. Some species treatments are incomplete, with only the description of staminate flowers or fruit, which makes it difficult to elucidate more precisely which characters are better suited for species separation (Sousa and Gurgel, 2023). The members of this family are typically twining or, less commonly, erect shrubs or small trees. Their leaves are petiolate and exstipulate, generally simple, and may be entire or lobed. The inflorescences can take the form of racemes, panicles, or occasionally cymose heads, often featuring numerous flowers, though solitary or paired flowers may also occur. These inflorescences are typically axillary or situated on leafless twigs, with female specimens often exhibiting less branching. The species are dioecious, and the flowers are small and regular, with rare instances of slight irregularity. In male flowers, the sepals range from 3 to 12 or more, typically arranged in whorls of three, though a single sepal may be present. These sepals can be free or slightly connate, and they may be imbricate or valvate. The petals can vary from 6 to 1 or may be absent, and they are usually free or connate, typically imbricate in arrangement. The stamens number between 3 to 6 or more, with rare occurrences of 2, and can be either free or united. Female flowers generally possess sepals and petals similar to those of male flowers, though they may be fewer in number. Staminodes may be present or absent. The carpels can be 3, 6, or more, and are usually free, with rare instances of a single carpel. Each fruit contains one seed, with ovules numbering 2, although only one develops into a seed, attached to the ventral suture. The fruits are drupes containing a single seed. The exocarp is either subcoriaceous or membranous, while the mesocarp can be somewhat fleshy or fibrous. The endocarp is woody or bony, often exhibiting a rugose, tuberculate, echinate, or ridged exterior, frequently with an intrusion of the placenta (condyle). The embryo may be straight or curved, and the endosperm can be either absent or present, with or without ruminations. The cotyledons are either flat or somewhat terete, and can be foliaceous or fleshy, arranged divaricately or appressed (Kessler, 1993). Fifteen species of Menispremaceae family are documented along with their uses. The details are below (Plate 1)

***Anamirta cocculus* (L.) Wight & Arn.**

It is commonly known as the fish berry plant, characterized by its climbing habit and woody stems. The plant's morphology includes small, greenish-white flowers that are typically borne in axillary clusters, leading to the development of small, round berries. The leaves are alternate, simple, and have a glossy appearance (Nilamudeen et al., 2024; Dar and Paul, 2018)

Medicinal uses: *Anamirta cocculus* has a rich history of traditional medicinal uses, particularly in various indigenous cultures across Asia. It has been employed in traditional practices for its antimalarial properties. The plant is known to contain active compounds that exhibit efficacy against *Plasmodium* species, making it a valuable resource in regions where malaria is endemic (Mutiah et al., 2013). Furthermore, the indigenous tribes of India have historically used the plant for various ailments, including gastrointestinal issues, urinary disorders, and skin diseases, showcasing its versatility in folk medicine. Its berries are traditionally employed to stun fish for easier capture (Nilamudeen et al., 2024).

***Cissampelos pareira* L.**

It is commonly known as velvet-leaf or abuta, is a widely distributed climbing vine. This perennial plant is native to tropical regions of the Americas, Asia, and Africa, and is known for its versatile applications in traditional medicine. The plant exhibits a unique morphology, characterized by its long, slender, and prostrate stems that can reach up to 10 meters in length. The leaves are simple, with a short petiole and an elliptic, flat blade The leaves have a fleshy texture (Manu et al., 2012).

Medicinal uses: It has been used in traditional medicine for centuries across various cultures. It is known for its anti-inflammatory, diuretic, and analgesic properties. In Ayurveda, it is used to treat urinary tract infections, respiratory disorders, and digestive issues. It is also used to manage menstrual disorders and as a general tonic to improve overall health. The roots and leaves are often employed in herbal remedies, either in decoctions or as a paste (Kumari et al., 2021; Satpathy and Saini, 2024).

***Cocculus hirsutus* (L.) W. Theob.**

It, commonly known as Broom Creeper, is a climbing shrub with slender, twining stems. The leaves are simple, alternate, and ovate to heart-shaped, with a rough texture and a pointed tip. The plant produces small, greenish-white flowers in axillary clusters. The fruit is a small, globose drupe, turning red or black when ripe. The plant is covered with fine hairs, giving it a slightly hirsute or hairy appearance (Nisha et al., 2023).

Medicinal uses: It is used in traditional medicine to treat fever, skin disorders, and urinary tract infections. The leaves are often applied as a poultice to soothe joint pain and inflammation. The plant is also used as a general tonic to boost health and vitality. Additionally, it is employed in treating respiratory issues like coughs and asthma (Logesh et al., 2020; Nisha et al., 2023).

***Coscinium fenestratum* (Gaertn.) Colebr.**

It is a large woody climbing plant with robust and yellowish-brown stems. The leaves of the shrub are large, ovate or oblong in shape or leathery in texture and smooth with well distributed veins. The plant produces small yellow flowers in the leaf axil which are borne in clusters. Its fruit is round, a small berry which becomes red when ripe. The color of the stem which is bright yellow due to high berberine content (Nayak et al., 2012).

Medicinal uses: The stem of the plant is rich in berberine which is used to heal infectious diseases of digestive system and liver. It is equally used for treatment of diabetes and for treatment of skin and eye infections. In Ayurveda, it is used in the form of a bitter tonic to purify blood and stimulate the body. It is used to clean the surface of the skin and heal external wounds and ulcers (Madhavan et al., 2014).

***Cyclea peltata* (Burm.f.) Hook.f. & Thomson**

It is a perennial climbing-woody plant with long, coiled twigs. The foliage is special, peltate with wide oval shaped leaves that are also smooth and end in erect tips. They are dark green above and light green beneath. The inflorescence bears small yellowish green flowers arranged in heads. The berries are small drupes that range in color from red to black when ripe, each containing one seed (Sreelakshmi et al., 2024).

Medicinal uses: For centuries, it has been applied in the practice of Ayurveda as an anti-inflammatory, diuretic and analgesic. Typically, it is used to relieve fever, digestive problems, and respiratory issues such as cough, and asthma. The root and the stem are frequently used in herbal medicines to enhance the activity of the liver and cleanse the body. It is also used to cure cutaneous diseases including wounds and ulcers (Poonghuzhali et al., 2022; Judy et al., 2022).

***Diploclisia glaucescens* (Blume) Diels**

It is a large climber with large thick stems. The leaves are wider at the broadest part of the apex and narrow towards the base with a waxy texture and a large central midrib. Small, greenish-yellow flowers grow in axillary clusters, pinkish-brown in colour. The fruits are small, round, drupe type and the mature fruits are red or black in color (Sreejit et al., 2019).

Medicinal uses: It is one of the important medicinal plants used in traditional medicine which can be used as anti-inflammatory, analgesic and antipyretic. It is prescribed in conditions such as fever, arthritis and other inflammatory illnesses. It is also used in the treatment of digestive disorders such as diarrhea and dysentery among other ailments. The roots and stems of this plant are used in traditional medicines in preparations meant for purging of the body and in cases of liver diseases (Sreejit et al., 2019; Prabham and Kumar, 2020).

***Menispermum canadense* L.**

Commonly known as Canadian Moonseed, it is a deciduous climbing plant forming slender twining vines. A large leaf is characterised by its shape which ranges from heart-shaped to broadly ovate with a smooth to slightly serrate margin and a pointed apex. It bears small yellowish green flowers in small corymbose racemes which are axillary in appearance. Fruits are characterized by small and round drupes with a solitary seed usually in arrays (Brinkman and Phipps, 1974).

Medicinal uses: It is used in management of ailments like respiratory tract infections, gastrointestinal disorders and dermatological disorders. The roots of the plant are used to treat fever, pain, and

inflammation. It is used in the strengthening of liver and to help in elimination of toxin from the body. Both its leaves and stems are also used in treating of wounds and ulcer (Sugimoto, 1999).

***Pachygone ovata* (Poir.) Miers ex Hook. f. & Thomson**

It is a climbing plant with thin, wiry and twining stems. The leaves of the plant are ovate to broadly cordate with entire or somewhat crenate margin and acuminate apex. The plant bears small, greenish or yellowish flowers which are arranged in axillary clusters. The fruits are small round berries, red or black when they become mature (Amalarasi and Jothi, 2019).

Medicinal uses: It is used in the treatment of diseases like arthritis, inflammation, malaria, and other skin diseases among other diseases. The extracts of the plant can also be employed for the treatment of the digestive disorders and the promotion of liver function. It is used in respiratory diseases and used as tonic (Dasgupta et al. 1979; Amalarasi and Jothi, 2019).

***Parabaena sagittata* Miers ex Hook.f. & Thomson**

It is an herbaceous climber with slender twining branches that are more or less red or brown in colour. Leaves are sagittate type having large rounded base in which it gradually tapers off to sharp acute apex. They typically have smooth edges and a prominent central vein. The plant bears small, greenish or yellowish flowers. These flowers grow in clusters and most of the time develop from the axils of the leaves. The fruits are small and globose drupes that are usually red or black in color when they ripe (Chinh et al., 2015).

Medicinal uses: It has been used to cure inflamed joints, fever and is also used to treat issues concerning the digestive system. They use the extracts from the plant, for instance, in treating respiratory disorders and skin infections. It is used as a general tonic that would promote health in the body (Wang et al., 2007; Jacques and Bertolino, 2008).

***Pycnarrhena planiflora* Miers ex Hook.f. & Thomson**

It is a climbing vine, slender twining stem with woody straigious texture and simple leaves, opposite, ovate to elliptic in shape and 5–11 cm long. The leaves are large, flat and pointed at the end, ovate to elliptic, crenulate to sub-coricate at the margins. The plant bears small flowers which are greenish or yellowish and grow in stems and these flowers mostly come out from the axil of leaves. The fruits are small, round and often black when ripe (Arigela and Singh, 2018).

Medicinal uses: Leaves and stem are traditionally used to treat joint pain, fever, and digestive disorders. Extracts of the plant are frequently used to treat respiratory conditions and skin infections. It is used as a tonic and improve overall health (Azman et al., 2022).

***Stephania japonica* (Thunb.) Miers**

Stephania japonica is a climbing or sometimes sprawling vine with slender twining stems. Leaves are large, heart-shaped to kidney-shaped, margins entire and the surface shiny green; they are usually

alternate on the stem. Flowers small, inconspicuous, green or yellow and often in clusters. Fruit small, rounded and generally dark when mature (Das et al., 2019).

Medicinal uses: It is traditionally used for its anti-inflammatory, analgesic, and diuretic properties. It is commonly employed in herbal medicine to treat conditions such as joint pain, fever, and urinary tract infections. The plant is also used to manage respiratory issues like coughs and asthma. Additionally, it is believed to support liver function and promote overall health (Hossain et al., 2017).

***Stephania wightii* (Arn. ex Wight) Dunn**

It is a climbing vine with slender, twining stems covered most of the time with fine hairs. The leaves are large, heart-shaped or kidney-shaped with a smooth glossy surface and a prominent central vein. It bears small, greenish, or yellowish flowers in dense clusters, while its fruits are small, rounded drupes, usually turning dark upon ripening (Hui et al., 2017).

Medicinal uses: Traditionally it is utilized in various ailments like joints pain, fever, and urinary tract infections. The plant is utilized to treat digestive problems and respiratory conditions. The plant is also used to manage digestive issues and respiratory ailments. It is used to support liver health and enhance overall well-being (Danya et al., 2013a; Danya et al., 2013b).

***Tiliacora acuminata* (Lam.) Miers**

Tiliacora acuminata is a small, climbing vine with slender, twining olive-green to brownish stems. Leaves large, ovate to lance-shaped, smooth or slightly wavy along the margin, pointed at the apex; glossy green; alternate on the stems. Small greenish or yellowish flowers are borne in clusters. Fruits small, rounded, usually dark at maturity (Simon et al., 2016).

Medicinal uses: Traditionally, it is used for joint pain, fever, and even infection of the urinary tract. The plant deals with digestive troubles like diarrhea and dysentery. It is also used in respiratory health and also for general tonic (Ben et al., 2014; Manda et al., 2014).

***Tinospora cordifolia* (Willd.) Hook. f. & Thomson**

Tinospora cordifolia is commonly known as Guduchi or Giloy and is a woody climber carrying thick, twining stems. Leaves are cordate at their base and glabrous, having an acuminate apex. Flowers greenish-yellow-colored are emitted in axillary clusters. The fruits are small, round, and usually reddish or black when mature (Saxena and Brahmam, 1995; Kumar et al., 2022).

Medicinal uses: It is an important part of the traditional system of medicine and possesses various pharmacological actions, such as immunomodulation, anti-inflammatory, and antioxidant effects. It is commonly used to boost immunity, treat fever, and manage diabetes. The plant is also employed in herbal remedies for digestive issues, such as indigestion and diarrhea, and for detoxifying the body. Additionally, it is used to support liver health and enhance overall vitality (Mittal et al., 2014; Khan et al., 2016).

***Tinospora sinensis* (Lour.) Merr.**

It is a woody vine with a slender, twining stem, often reddish or brownish in color. Leaves are ovate to cordate, glabrous, apically acuminate, and oppositely disposed on the stems. Flowers are greenish-yellow in axillary clusters. Fruits are globose small drupes, usually dark when mature (Udayan et al., 2004).

Medicinal uses: It is traditionally used to treat conditions such as fever, infections, and digestive disorders like indigestion and diarrhea. The plant is also used to support liver health, manage diabetes, and enhance overall vitality. Additionally, it is believed to act as a general tonic, promoting overall well-being and boosting the immune system (Das et al., 2024; Hegde and Jayaraj, 2016).

Plate 1: Some common medicinal species from Menispermaceae family A) *Cocculus hirsutus***,** B) *Tinospora cordifolia,* C) *Tiliacora acuminata***,** D) *Cissampelos pareira*

Conclusion

Importance of Menispermaceae family has long been recognized for its medicinal properties. Diverse genus in this family has various chemical constituents of promising medicinal value. In Ayurveda, important medicinal plants of this family are used for diverse diseases and disorders. Several important plants belonging to this family have significant value to control and treat many pathogenic, metabolic, genetic, and other lethal diseases. Therefore, it is important to have the correct identification of plants to avoid incorrect harvesting of plants and chemicals extracted which later might lead to the destruction of plant resources materials. It's therefore necessity of further DNA barcode study to identify new novel species and proper conservational strategies should be initiated regarding this important plant family.

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