



MEDICINAL EXPLOITATION OF THE PLANTS BELONGING TO THE FAMILY: MENISPERMACEAE

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ABSTRACT

Many plants of Menispermaceae family are medicinally important as they contain chemical constituents which have significant biological activities of varied nature and thus are useful in various human diseases along with diseases of animals. Chemical characterization of some of such constituents of certain plants have already been done, while a large number of Menispermaceae plants have yet not been thoroughly chemically investigated. This paper is to review some of the important aspects regarding studies reported earlier on chemical identification and biological activities of some plants of Menispermaceae family.

KEYWORDS: Plants, Menispermaceae, Chemical constituents, Biological activities.

INTRODUCTION

In 1789, A. L. de Jussieu named the Menispermaceae family. Members of this moderately studied family comprises of about 70 genera and 420 species. The plants belonging to this family are flowering, mostly climbing plants and the great majority of the species can be found in countries with a tropical climate. The principal genera found are Albertisia, Anamirta, Anomospermum, Aspidocarya, Beirnaertia, Burasaia, Borismene, Calycocarpum, Coscinum, Curarea, Dioscoreophyllum, Echinostephia, Eleutharrhena, Fibraurea, Hypserpa, Hyperbaena, Jateorhiza, Kolobopetalum, Limaciopsis, Menispermum, Orthogynium, Odontocarya, Orthomene, Parabaena, Pachygone, Perichasma, Rhaptonema, Sciadotenia, Spirospermum, Sinomenium, Stephania, Synclisia, Syrrhonema, Tiliacora, Telitoxicum, Tinomisium, Triclisia, Tinospora.

Table 1: Scientific Classification.

Kingdom	Plantae
Class	Magnoliopsidae
Sub-Class	Magnoliidae
Super Order	Ranunculiflorae
Order	Ranunculales
Family	Menispermaceae

Conventional medicines otherwise called the well-known traditional medicines are an imperative part of Indian culture and fortunately, we have a huge repository of medicinal plants that are used in these

traditional systems. These ethno medicinal species and their uses are well accepted in ethnic traditional systems like Unani Ayurveda, Siddha, and Allopathy. Medicinal plants are the backbone of customary medicines in most of the developing countries, which means that majority of the world relies on these medicinal plants as a basis of their primary medication, especially in rural areas. For centuries, plants have remained the foremost source of medicine. They provide a storehouse of remedies to almost all ailments of humankind. Tribal communities are also using plants in different forms like crushed, powders, or mixtures for this purpose. However, the term Natural products mainly focus on organic and inorganic scaffolds from nature, in which the main attraction is towards the organic moieties with structural diversities. Isolation, identification of structure, and biological evaluation of these secondary metabolites are the major processes involved in Natural product chemistry. It has been estimated that over 3,00,000 secondary metabolites exist [Mc Murry, 2009] which comprises alkaloids, flavonoids, terpenoids, sterols, etc. Most of these are reported to have excellent medicinal properties, which are subject to extensive studies. Also, secondary metabolites have often attracted the curiosity of researchers because of their biological effect on other organisms. Natural products, especially secondary metabolites, have great potential for developing novel therapeutic agents and are usually stated as keystones of the drug discovery process. The diverse chemical structure of natural

products can serve as a lead for novel drugs. Due to this reason, there has been an endlessly budding interest of drugs originating from plants, which have been found to form an important class for disease control. Aspirin, morphine, paclitaxel, etc. are some examples of plant-derived drugs in modern medicine.

BRIEF DESCRIPTION OF SOME SELECTED SPECIES

1. *Stephania*

Genus *Stephania* contains most number of plants; 43 varieties. Around 60 species are found in subtropical and tropical regions of Asia and Africa, 37 species including 30 endemics in China and few in Oceania. Tuberos roots of this genus are widely used in Chinese medicine. Most of *Stephania* genus are found as slender climbers and are conventionally used for the treatment of various sicknesses like dysentery, pyrexia, indigestion, urinary diseases, tuberculosis, dyspepsia, sore-breasts, abdominal ill, asthma, sleep disturbances, diarrhea, wounds, headache, leprosy, etc. Likewise, the other species of menispermaceae family, this genus is also famous for its alkaloid content, having more than 50 kinds of alkaloids such as morphines, hasubanans, berberines, hasubanalactams, and aporphines. *S. glabra* (Roxb.) Miers is one among the well-studied plants in this genus. Ethnobotanically, its rhizome decoction is used as antipyretic, antituberculosis, antidyenteric, etc. The aqueous extract of the dried rhizome along with the aerial root of *Trichosanthes multiloba* is used as an antianthelmintic agent against intestinal worms in Meghalaya. Properties like aphrodisiac, sedative, and analgesic effects were reported for the stems of *S. dinklagei* Diels, while the leaves of this plant is used to cure impotency in males and infertility in females. The roots of *S. hernandifolia* was used as a remedy for fever, dyspepsia, diarrhea, and urinary diseases. *S. rotunda* Lour is commonly used as an agent to treat dysmenorrhea, abdominal ill, asthma, dysentery, wounds, fever, indigestion, head-ache, sore-breasts, etc. The roots of two *Stephania* genus; *S. tetrandra* and *S. Moore*, have been used in combination against hepato fibrogenic disease and also used as diuretic, antipyretic, anti-phlogistic, anti-rheumatic, and analgesic in China for centuries. *S. cepharantha*, another species, is known for its activity against various long-lasting diseases, and venomous snakebites in Japan. The Chakma and Tonchonga tribes of Bangladesh use vines of *S. japonica* for curing leucorrhoea, urinary problems like burning sensations during urination, presence of semen in urine, etc. Apart from this, these species also possess analgesic activity, anthelmintic activity, anti-viral activity, anti-inflammatory activity, antimicrobial activity, antimalarial activity, antipsychotic activity, anti-proliferative activity etc. [Kumar, 2010].

2. *Cocculus*

About eight species are reported for this genus worldwide including Africa, South Asia, Europe, Central, and North America, Pacific Islands, and two species in China [Gilbert,]. They are mostly found as dioecious climbers, rarely trees, shrubs, or herbs. *Cocculus orbiculatus*, *Cocculus carolinus*, *Cocculus laurifolius*, *Cocculus orbiculatus* var. *orbiculatus*, *Cocculus diversifolius* are some of the species reported from this genus. *Cocculus hirsutus*, commonly named as broom creeper, ink berry is an important flowering plant of this genus and has a threatened belonging. It is also well-studied. In Malayalam, it is renowned as pathalagarudakodi, pathalamuli, etc. In India, these are mainly found in Rajasthan [Jangir, 2016]. Tribals of Jhabua and Khargone and Dhar use the fruits of this plant to cure jaundice [Rakkimuthu, 2012]. The plant is also used as herbal medicines to treat numerous maladies including inflammation, rheumatism, arthritis, muscle swelling, insect bites, pains, etc [Rishikesh, 2017]. It also have properties like diuretic, laxative. The root extract exhibited pain-relieving and anti-inflammatory effects. The leaves are useful against cough, neuralgia gonorrhoea, ophthalmia, and used to treat skin infections. In Rajasthan, the cooked leaves are taken as a remedy for night blindness. Recent studies have shown the antidiabetic and spermatogenic activity of *C. hirsutus* in rats also [Sharanabasappa, 2014].

Cocculus pendulus also well-known as *Cocculus ellipticus*, *Menispermum ellipticum*, *Cocculus laevis*, is used in the traditional system for treating in leprosy, syphilis, menstrual disorder, helminthic, inflammation, jaundice, malaria, fever, and rheumatic pain. The plant contains phytochemicals such as cocculine, sinocculine pedulin, cocculidine, and cocculinine, while the root contains sangoline, pelsesine, columbin, etc. Pharmacologically it possesses anti-inflammatory activity, wound healing activity, spermicidal activity, anti-oxidant activity, etc [Jangir, 2016].

3. *Cissampelos*

Cissampelos is a native of southern Africa. About 25 species are found, commonly in America, Africa, and few in Asia and one species in China. The name “*Cissampelos*” is emerged from Greek words “*kissos*” meaning “Ivy” and “*ampelos*” denotes “vine”. The name refers to the ivy-like growth of this plant with green rambling branches and the grape-like racemes of fruits.¹⁸ One of the well-studied species is *Cissampelos pareira*, which is a climbing herb, known as ambastha or lagupatha in India’s traditional system. In English, it is commonly referred to as velvet-leaf or Abuta and in Malayalam as malathangi, vattavally, etc. Ethnobotanically, the plant, especially its roots, are used for treating several infirmities like dysentery, asthma, urinary difficulties like cystitis, etc. Two novel tropolisoquinoline alkaloids were isolated from

the plant, Pareirubrine A and B having anti-leukemic properties. Deyamittin, pelosine, tertrandrine are also identified from the plant. The root of the plant possesses *l*-curine, menismine, pareirine, hayatine etc. It also has 0.2% essential oils [Manu, 2012].

Cissampelos capensis, commonly known as “dawidjies” or “dawidjieswortel” in Africa, is one of the best known medicinal plant used by the Khoisan tribes of Maharashtra and rural natives of South Africa. Salutaridine, a morphinane alkaloid, aporphine alkaloids like Bulbocapnine, dicentrine were the main compounds reported from the leaves, thoughbulbocapnine, cissacapine, cycleanine and insularine contained in the stem are the major compounds. The Khoisan of southern Africa gave a special significance for *C. capensis* in their ethnomedicine. The rhizomes are called as “dawidjies” or “dawidjiewortel” and are extensively used as a diuretic remedy and blood sterilizer. It also possesses several other pharmacological activities like antidiabetic activity, anticancer activity, antipyretic activity, etc. It is also taken for tuberculosis and helps in menstrual problems and pregnancy-related problems. Paste of leaves is used for wounds, syphilitic sores and snakebite [De Wet, 2011].

4. Tinospora

Tinospora belongs to the tribe Tinosporeae which is characterized by weakly ruminant endosperm and foliaceous cotyledons. Over thirty species are reported from this genus that is widely distributed in tropical and subtropical Asia, Australia, Africa, the Pacific Islands, and Madagascar. Six species are present in China including three endemic. These deciduous species can grow from their detached stem, which helps them to escape deforestation.

It is reported that there are around 35 Tinospora species are present. These are generally climbing shrubs and mostly found in the subtropical and tropical areas of India. There are mainly three species: *T. crispa*, *T. cordifolia*, and *T. malabarica*. *T. cordifolia* is a deciduous climbing bush which are widely distributed in Asia, Africa, Australia, etc.

In Asia, it is found abundantly all through India, Sri Lanka, Bangladesh, and Nepal. It is also known as Guduchi, Giloy, or Amrita in Ayurveda. Guduchi is one among the most mentioned herbs of Ayurveda, used in various formulations like samshamaniya (maintain homeostasis), medhyarasayana etc [Kundu, 2016].

Preliminary investigation of aerial parts exhibited the existence of various phytochemicals like flavonoids, saponins, sterols, alkaloids, tannins, glucosides etc [Singh, 2017]. In 2015, Sharma *et al.* reported the *in-vitro* and *in-vivo* anti-diabetic properties of various extracts [Sharma, 2015]. The anti-proliferative ability of extracts was reported by Polu *et al.* and noticed that ethanol extract and dichloromethane extract exhibited noteworthy anti-proliferative activity in MCF-7 (breast carcinoma) and HCT-116 (human colorectal carcinoma) cells [Polu, 2017].

In the Indian medicinal system, the aqueous extract is used as a medication against diabetes, hepatitis, etc. Oral administration of alcoholic extract is a remedy for increased blood glucose levels [Sengupta, 2009]. In addition to Ayurveda, the plant finds a significant indication for its use in tribal or folk medicine. *Pramehaghna*, *Pramehahara*, *Mehaghna*, and *Mehahara* some of the antidiabetic agents containing *T. cordifolia* described in various Ayurvedic texts.

Ayurvedic Pharmacopoeia of India has also mentioned its antidiabetic efficacy. Maharashtra tribals, the Korkus, using this plant for treating fever, polyuria, and, diabetes [Sharma, 2015]. *T. cordifolia* also rich in a wide variety of secondary metabolites. Furan diterpenoids, clerodane diterpenoids, alkaloids, steroids, glycosides, lactones, phenolic compounds, and aliphatics are reported specifically from this plant. Protoberberines are the major class of alkaloids present, which include Berberine, jatrorhizine, choline, palmatine, magniflorine, isocolumbine, etc. Other major isolated compounds include the norditerpene furanditerpene glycosides such as cordifoliosides, palamatoside C and F and amritosides, sesquiterpenes tinocordifolioside and tinocordifolin. The clerodane diterpenoids cordioside, tinosporine and tinocordioside were also present in this plant.

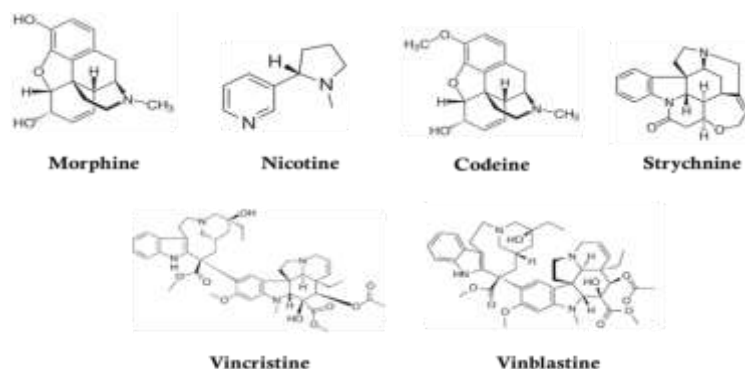


Figure 1: Alkaloids in medicine.

The plant is mainly used in Ayurveda for its activity against diabetes. Alcoholic and aqueous extract of aerial part of *T. cordifolia* possesses high hypoglycaemic activity [Patel, 2012]. Immunomodulatory activity of different extracts like hexane, ethyl acetate, n-butanol, water, and isolated

compounds were evaluated by Bala *et al.* Compounds 11-hydroxymustakone and N-formylannonain gave significant splenocyte proliferation, but more activity was found in extracts, suggesting that the activity is not concentrated on single compounds [Bala, 2015].

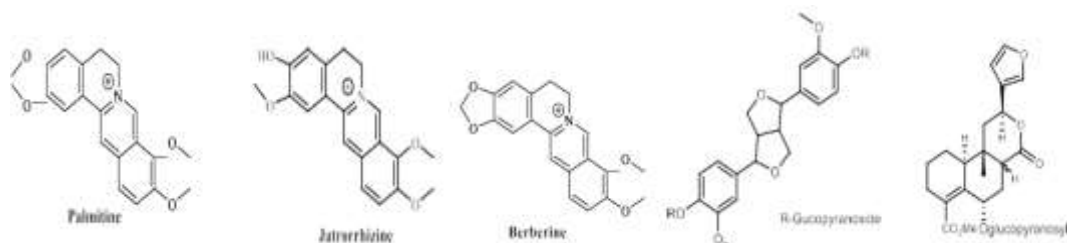


Figure 2: Some compounds reported from *T. cordifolia*.



Figure 3: Some Compound reported from *T. crispa*.

5. *Coscinium*

There are only two species reported from this genus; *Coscinium fenestratum* (Goetgh.) Colebr, *Coscinium blumeianum* Miers ex Hook.f. & Thomson. *Coscinium fenestratum* (Gaertn.) Colebr. is an unsympathetically endangered species and highly traded medicinal plant indigenous to South Asian regions and in some European parts. In Europe, it is known as False Columba or Tree turmeric. In India, it is restricted to the high rainfall wet evergreen, semi-deciduous and moist evergreen forests of Western Ghats. The plant is an important ingredient of Ayurvedic formulation Daruharidra and in Sri Lanka as a yellow dye. Industrially and medicinally, the plant is facing an overconsumption. The plant is chopped before it gets fit for its regeneration which makes it highly endangered. This overconsumption and difficulty in regeneration, has endangered it and the plant is now endemic to the Western Ghats. The plant is considered as critically endangered in Kerala, Maharashtra, Tamil Nadu, etc. due to 80% decline of wild population [Tushar, 2008].

Coscinium fenestratum is a large woody climber, which grows with a cylindrical and yellowish stem. The plant is also renowned as *C. maingayi* Pierre, *Coscinium peltatum* Merr., *Menispermum fenestratum* Gaertn, *C. Wallichianum* Miers, etc. In Malayalam, it is well known as maramanjil, manjavalli, etc. and Sanskrit, it is known as darvi, daruharidra etc.

6. *Tiliacora*

22 species are reported from genus *Tiliacora*, of which twenty species are scattered across Africa and two are found in Southeast Asia. These species are generally used to treat snakebites, as an antimalarial drug, for menstrual problems, and to treat gastrointestinal. It is commonly known as the stem-fruit climber or elbow-leaf [De Wet, 2016].

Tiliacora acuminata. *T. acuminata* or *T. racemosa* is a large woody climber found throughout India, commonly called Tiliacoru, Kelelata, or Bhaglata, etc. Tribal communities like Santhals, Lodhas, Oraon, Mundas, Kherias, and Bhumijis of West Bengal use this plant for treating skin infections, filariasis, and snake and insect bites. In Ayurveda, it is called Krishnavetra which offers medication to so many diseases, specifically cancer [Kumar, 2017].

Table 2: Some plant species of Menispermaceae family used in folk medicines.

Botanical name	Local name(s)	Part(s) used	Ailment(s) treated
<i>Cocculus hirsutus</i> L. Diels <i>Menispermum</i>	Sundal shona, Dhui lota (Bangla).	1. Whole plant 2. Leaf, stem (in combination)	1. Gonorrhoea, eczema, malaria. synonym 2. Sedative, low sperm count. <i>irsutum</i>
<i>Stephania glabra</i> Miers synonym <i>Stephania rotunda</i> Hook. f. & Thoms.	Muchi lota (Bangla).	1. Leaf	1. Fungal infections of the skin.
<i>Stephania japonica</i> (Thunb.) Miers synonym <i>Menispermum japonicum</i> Thunb. pata, Datache,	Aknodi, Akonadi, Akondi, Fuit pata, Taka-muti, Makondi, Moshi lota, Moochni piles, cough, bloating, leprosy, helminthiasis, Mucchani, Dual, Modi-ani, Nimukha, Phot pata, Dhoi pata, Foter pata, Dudh-raaz pata, Doi pata, Pitha pata gach (Bangla); Toanak (Chak tribe); Muicchani lota (Chakma and Tonchonga tribes); Fotik bifang, Akanadi, Prachina, Pathika (Garó tribe); Toak-nueh-pang (Marma tribe); Karendha-mannhe (Santal tribe); lota, Dufai-u-chena (Tripura tribe).	1. Whole plant 2. Leaf 3. Stem 4. Meristem 5. Root 6. Flower 7. Leaf, flower (combination) 8. Leaf, root (combination) 9. Leaf, stem (combination) 10. Leaf, root, bark (combination)	1. Edema, headache, diabetes, infectious diseases, eczema, acne, sprain, dysentery, sexual weakness, to increase sperm, vomiting, fever, burning sensations in the body, gynecological problems, cardiovascular disorders, poisoning, ward off evil spirits (magic). 2. Cardiovascular disorders, diarrhea in children, edema, whitish discharge during urination, burning during urination, diarrhea caused by excessive outside temperature, abscess, pain, helminthiasis, skin diseases, fever, spermatorrhea. 3. Arthritis, joint displacement, bone fracture, indigestion, presence of mucus in stool, leucorrhoea, fatigue in hand or leg, fever. Naimara, 4. Debility, excessive milk in nursing mother's breasts. 5. Coughs, throat pain (adults), colic, ear lesions (children), to ease delivery. 6. Blood purifier, problems related to ovary. 7. Bone fracture, debility. 8. Fever, diarrhea, urinary problems. Muich-chali 9. Fever in small children, jaundice. 10. Fever, diarrhea, cholera, acidity, difficulties in delivery during pregnancy.
<i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thoms. Synonym <i>Tinospora glabra</i> (Burm f.) Merr., <i>Menispermum cordifolium</i> Willd., <i>Cocculus cordifolius</i> DC, <i>Menispermum glabrum</i> Brum.f. Heru-awar (Santal tribe);	Guloncho lota, Guloncho, Gronchi lota (Bangla); Gulnoi, Guloncho, Poddo guloncho, Guruchi, Samorjofu (Garó tribe); Teel lota gach, Dusha shandari (Tripura tribe).	1. Whole plant 2. Stem 3. Shoot tip 4. Root 5. Leaf, root (combination) 6. Leaf, stem (combination)	1. Malaria, liver diseases, tuberculosis, gout, asthma, febricity, measles, burning sensations in body, coughs, mucus, fever, helminthiasis constipation, stomach ache, leucorrhoea, to increase thirst (i.e. to induce drinking), rheumatism, piles, respiratory problems, cardiovascular disorders, infrequent urination, bloating, enlarged spleen, skin infections, swelling of legs and hands, hypertension, diabetes, snake bite, pain, urinary tract disorders. 2. Frequent fever, muscle pain, joint ache, gastrointestinal discomfort, helminthiasis, rheumatism, chicken pox. 3. Hepatic disorders, diabetes, high fevers. 4. Malaria. 5. Dripping of saliva from mouth, loss of movement of tongue. 6. Rheumatism, fever, fever with mucus, gastric troubles, leucorrhoea, pain during urination, edema.
<i>Tinospora crispa</i> (L.) Hook.f. & Thoms. Synonym <i>Menispermum crispum</i> L., <i>Tinospora rumphii</i> Boerl.	Ghol-loai, Guloncho -bun, Poddo golanchi, Poddo khurchi, Golonchi, Bashi-shondori, Aam-guloncho (Bangla).	1. Whole plant 2. Stem 3. Leaf, stem (combination)	1. Tetanus, leprosy, diabetes, malaria, jaundice, syphilis, sprain, eczema, sedative, debility, pain, loss of appetite, cold, fever. 2. Body ache, rheumatic pain, jaundice. 3. Pyrexia (fever of unknown origin).
<i>Tinospora sinensis</i> (Lour.) Merrill synonym <i>Campylus sinensis</i> Lour., <i>Tinospora malabarica</i> (Lam.) Hook. f. & Thoms	Guloncho (Bangla).	1. Stem	1. Tuberculosis, debility, burning sensations during urination.

CONCLUSION

Out of about half thousand species of plants belonging to Menispermaceae family as mentioned in the introduction of this paper, only few plants have been described as examples hereon which deliberations of some kind have been made for their chemical constituents along with

biological activity of some such constituents. Thus, it is clear that the family Menispermaceae is medicinally important and a lot is still there to explore undone portions of already investigated plants as well as new chemical constituents and biological activities of other plants of this Menispermaceae family.

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