

AMRUTHAVALLI (*TINOSPORA CORDIFOLIA*) MULTIPURPOSE REJUVENATOR

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ABSTRACT

The last decade has seen a global upsurge in the use of traditional medicine (TM) and complementary and alternative medicines (CAM) in both developed and developing countries. Various forms of traditional, complementary and alternative medicines are playing a progressively more important role in health care globally and therefore their safety, efficacy, and quality control are important concerns today. *Tinospora cordifolia* (Willd.) Miers. (Amruthavalli or Guduchi), is one of the most versatile rejuvenative herbs widely used as a traditional medicine. It is mentioned in various classical texts of Indian Medicinal Systems and is cultivated throughout the Indian subcontinent and China. The therapeutic efficacy makes for its extensive usage in various systems of medicine. Pre clinical and clinical pharmacological studies affirm the importance of this herb. The notable medicinal properties are anti-diabetic, anti-periodic, anti-spasmodic, anti-inflammatory, anti-arthritis, anti-oxidant, anti-allergic, anti-stress, anti-leprotic, anti-malarial, hepatoprotective, immunomodulatory and anti-neoplastic activities. The principle constituents present in the plant are alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides. The present paper reviews the pharmacological and phytochemical aspects of the herb and its usage in different medicinal systems. However, the molecular mechanism of these activities of *Tinospora cordifolia* for its medicinal properties is to be elucidated.

Keywords: *Tinospora cordifolia*, Diterpenoid, Glycosides, Alkaloids.

INTRODUCTION

Tinospora cordifolia (Willd.) Miers ex Hook. & Thoms (Family: Menispermaceae) commonly known as Guduchi is an Indian medicinal plant and has been used in Ayurvedic preparations for the treatment of various ailments throughout the centuries. Ancient Hindu physicians prescribed it for gonorrhoea. European medical men in India became interested in the tonic and diuretic properties of *T. cordifolia*. Today, the drug and a tincture prepared from it have received official recognition in the Indian Pharmacopoeia. It has been used to treat general weakness, fever, dyspepsia, dysentery, gonorrhoea, secondary syphilis, urinary diseases, impotency, gout, viral

hepatitis, skin diseases, and anemia. In compound formulations, guduchi is used clinically to treat jaundice, rheumatoid arthritis, and diabetes. In Hindi, the plant is commonly known as Giloya, which is a Hindu mythological term that refers to the heavenly elixir that have saved celestial beings from old age and kept them eternally young.

The genus *Tinospora*

Tinospora is one of the important genera of the family, consisting of about 15 species. Some medicinally important species includes *T. cordifolia*, *T. malabarica*, *T. tomentosa*, *T. crispa*, *T. uliginosa*, etc.

Species - *Tinospora cordifolia* (Willd.) Miers. Family: Menispermaceae (moonseeds)

Common Name(s): Guduchi, amrita (Sanskrit), giloe, gulantha (Bengali), giloya (Hindi), gado, galo (Gujarati), duyutige, teppatige (Telugu), heartleaf moonseed (English).

Distribution: *Tinospora cordifolia* is a large deciduous climbing shrub found throughout India and also in Sri Lanka, Bangladesh and China.⁶

Morphology of the Plant

T. cordifolia is a glabrous, succulent, woody climbing shrub native to India. It is also found in Burma and Sri Lanka. It thrives well in the tropical region, often attains a great height, and climbs up the trunks of large trees. The stem is gray or creamy-white, deeply cleft spirally and longitudinally, with the space between spotted with large rosette-like lenticels. The wood is white, soft, and porous, and the freshly cut surface quickly assumes a yellow tint when exposed to air. Leaves are simple, alternate, exstipulate, long petiolate, chordate in shape showing multicoated reticulate venation. Long thread-like aerial roots come up from the branches. Flowers are small and Unisexual. Male flowers are in clusters female flower are solitary. Six sepals arranged in two whorls of three each. Six petals arranged in two whorls, they are obovate and membranous. Aggregate fruit is red, fleshy, with many drupelets on thick stalk with sub terminal style scars, scarlet coloured.^{16,4}

Microscopic Details

Cork- Older stem comprises of an outer zone of thick walled brownish compressed cells and an inner zone of thin walled colorless, tangentially arranged cells. The cork tissue is broken at some places due to lenticels. **Cortex-**Cortex is multilayered, outer few layers are made up of irregular, chlorenchymatous cells while cells of inner cortex is made up of polygonal cells that contain starch grains which are simple and ovoid. Many secretory cells are found scattered in the cortex. Pericycle shows the presence of fibers. **Vascular Bundles-** *Tinospora cordifolia* shows anomalous

secondary growth resulting in the formation of 10 to 12 wedged shaped external xylem which is surrounded by semi-circular strip of phloem alternating with medullary rays. Phloem cells contain calcium oxalate crystals. Presence of two layered cambium. Xylem consists of vessels, tracheids, xylem parenchyma and fibres. Pith is parenchymatous which contain starch grains.²⁰

Photochemistry

A large number of compounds have been reported from the aerial parts and roots of *T. cordifolia*. In the early 1900s, giloin, gilenin, and gilosterol, as well as the bitter principles columbin, chasmanthin, and palmarin, were identified in the plant. Apart from these reports also suggests the presence of wide range of alkaloids^{11,21} steroids, glycosides, polysaccharides, Berberine¹⁷, Sesquiterpenoid.^{22,15} Detail photochemistry of the plant is presented in the table.1.

Medicinal Systems

Ayurveda

Guduchi finds its mention in various classical referential texts of Ayurvedic System of Medicine like Charak, Sushrut, Ashtang Hridaya and , Bhava Prakash and Dhanvantari Nighantu with its synonymic names like *Amara*, *Amritvalli*, *Chinnarruha*, *Chinnodebha* and *Vatsadani* etc. In Sushruta Samhita, it is mentioned under "Tikta-Saka Varga" and claimed to be useful in treating Kustha (Leprosy), Maha-jvara (High fever), Svasa (Asthma) and Aruchi (anorexia). Charak Samhita and Ashtang Hridaya, it has been indicated in diseases like Kamala (Jaundice), Jvara (Fever) and Vat Rakta (Gout), etc. It is considered as a astringent, diuretic and potent aphrodisiac and curative against skin infections, jaundice, diabetes and chronic diarrhea according to Bhava Prakash. Medicinal properties of *Tinospora* is detailed in Dhanvantari Nighantu. It is a traditional belief among the Ayurvedic practitioners that *Guduchi Satva* obtained from Guduchi plant growing on Neem tree (*Azadirachta indica*) is bitter, more efficacious and is said to incorporate the medicinal virtue of Neem also.

Properties: Guna:- Guru, Snighda
 Rasa:- Tikta Kashaya
 Veerya:- Ushna
 Vipaka:- Madhura
 Karma (Action): Tridosahara (Balances vitiated Tridoshas) Kushtaghna, Vedanastaapana (Cures skin diseases and relieves pain) Jwaraghna (reduces fever), Vrishya (aphrodesiac), Rejuvenator (Rejuvenates body systems), Formulations: Guduchyadi churna, Guduchi taila, Dashmoolarishtha, Sanjivani vati, Kanta-kari avaleha, Chyavanaprasha, Guduchi sattva, Brihat guduchi taila, Stanyashodhana kashaya churana, Punctinimba churana, Guduchi ghrita, Amritaguggulu, Amritashtaka churna, etc.

Unani System

In Unani System, mostly "Sat Giloe" is incorporated in the preparations. "Arq Giloe" prepared from the fresh plant is considered a febrifuge, while "Arq Maul Laham Mako-kashiwala" is a general tonic.

Folklore

T. cordifolia finds a special mention for its use in tribal or folk medicine in different parts of the country. Some of the important uses mentioned are given below:

Naugarh and Chakia Block of Varanasi district, Uttar Pradesh (Baiga Tribals)- Guduchi (*T. cordifolia*) stem paste along with roots paste of Bhatkatiaya (*Solanum surattense*) are made into pills, that is used to treat of fever for three days.²⁹

Bombay (Fishermen) use *T. cordifolia* as drug in the treatment of fever, jaundice, chronic diarrhea and dysentery.²⁸

Khedbrahma (Tribes) of North Gujarat use the plant leafy vegetable. Powdered root and stem bark of *T. cordifolia* with milk is used to treat cancer; decoction of root is used as cure for dysentery and diarrhea.⁷ Jammu (J & K) and Bigwada (Rajasthan) Decoction of the stem as cure high fever.⁵ Bhuvneshwar (Orissa) use the warm juice of root of *T. cordifolia* orally for the treatment of fever.

Decoction of leaves along with honey is administered orally for fever by the people of Patiyala (Punjab).

The Muslim tribals of Rajouri, Jammu (Tawi) comprising Gujjar and Backwals used the plant in bone Fracture.³²

Pharmacological studies

Analgesic activity

An aqueous extract of *Tinospora cordifolia* decreased bronchospasm in guinea pigs, decreased capillary permeability in mice and reduced the number of disrupted, mast cells in rats.

Anticancer activity

A formulation containing *Tinospora cordifolia*, *Asparagus racemosus*, *Withania somnifera* and *Picrorrhiza kurrooa* markedly inhibited the suppression of chemotactic activity and production of interleukin-1 and tumour necrosis factor induced by the carcinogen ochratoxin in mouse macrophages.¹⁹

Antineoplastic activity

Aqueous, methanolic and dichloromethane extracts of *Tinospora cordifolia* showed dose-dependent increases in lethality to HeLa cells in vitro. The most potent activity was found in the dichloromethane extract.

Antioxidant activity

An extract of *Tinospora cordifolia* reduced the toxicity induced by free radicals and inhibited lipid peroxidation and the generation of superoxide and hydroxyl radicals *in vitro*. It reduced the toxic side effects of cyclophosphamide in mice as shown by the total white blood cell count, bone marrow cellularity and esterase-positive cells. It also partially reduced elevated lipid peroxides in serum and liver, as well as alkaline phosphatase and glutamine pyruvate transaminase^{18,19}.

Antistress activity

An ethanolic extract of the roots of *Tinospora cordifolia* normalized stress-induced biochemical changes in norepinephrin Antistress activity²⁴.

Antiulcer activity

An ethanolic extract of the roots of *Tinospora cordifolia*, in combination with *Centella asiatica*, afforded significant protective action against restraint stress-

induced ulcer formation. The activity was comparable to diazepam in rats.²⁵

Antidiabetic

Reports suggest that alcoholic extraction of the stem favors endogenous insulin secretion.¹⁴

Urinary Calculi

Water extract of the stem was experimentally evaluated for dissolution of urinary calculi.²³

Products of *Tinospora cordifolia*

Shilpa Pravang-Sexual Vitality.

Guduchi Tablets –General infection, immune disease, Hepatitis, Arthritis and anti-cancer.

Madhu Mehari-Dryness of mouth, relieves frequent urination and maintains the normal sugar levels.

Mussaffen-Blood purifier and as a check for skin diseases.

Rebuild-Anti-stress and anti-oxidant properties.

Septilin-check the respiratory infection

Tonplex-Increase the immunity and vitality.

Joint Muscle Excellence Tablets-Eliminate the toxins of joints.

Natadadrol-Androgen builder.

Toxicology

There is little known about the toxicology of *T. cordifolia* in humans. No adverse

reactions were noted when *T. cordifolia* stem extract was administered to rabbits up to the highest oral doses of 1.6 g/kg, and in rats at doses of 1,000 mg/kg of the whole plant extract. However, a 40% mortality resulted after mice were given 500 mg/kg body weight of an extract of the stems of *Tinospora*.

Conservation Status

Arrow-head Vine is listed as **vulnerable**. This species is eligible for listing as vulnerable under the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) (EPBC Act) as, prior to the commencement of the EPBC Act, it was listed as vulnerable under Schedule 1 of the Endangered Species Protection Act 1992 (Cwlth). Arrow-head Vine is also listed as vulnerable under the Threatened Species Conservation Act 1995 (NSW) and the Nature Conservation (Wildlife) Regulation 2006 (Queensland).

CONCLUSION

The therapeutic efficacy of *Tinospora cordifolia* makes it a primary drug in Indian Medicinal System. This has also been established by the clinical studies carried out for different ailments. These studies place this drug a novel candidate and drug development for the treatment of disease of all kinds.



Fig. 1: *Tinospora cordifolia* plant



Fig. 2: Inflorescence of *T.cordifolia*



Fig. 3: Plant with Fruits (drupelets)



Fig.4: Old Bark of the Plant



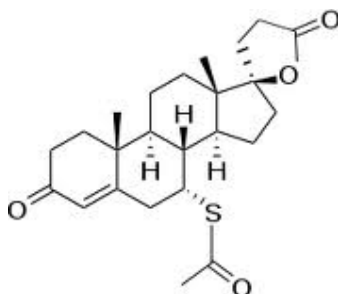
Fig. 5: Bark powder



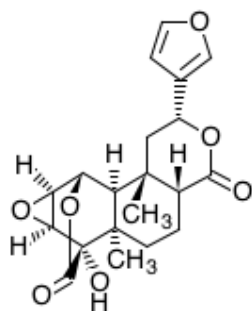
Fig. 6: Fruits (drupelets)

Structures of the active Principle

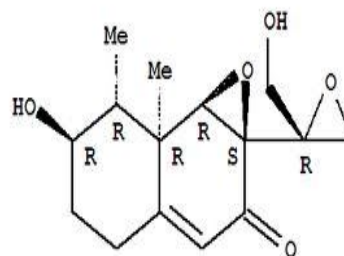
Diterpenoid



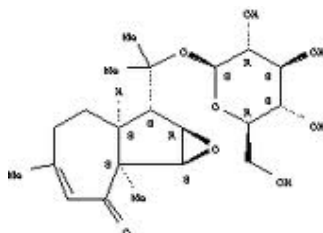
Structure of Furanolactone



Chasmanthin

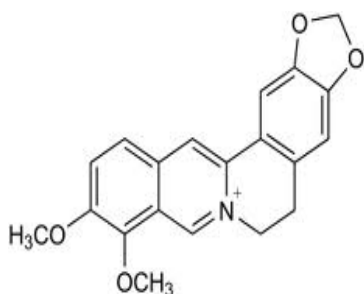


Tinocordifolin

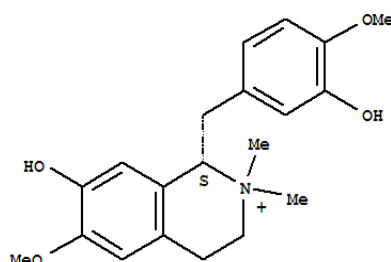


Tinocordifolioside cadinane

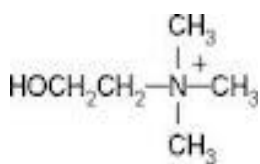
Alkaloids



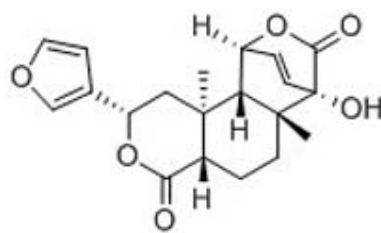
Berberine



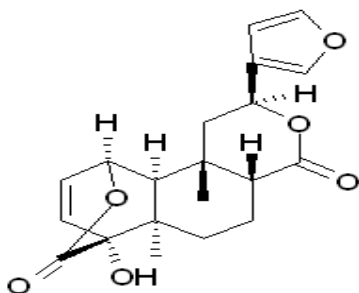
Tembetarine



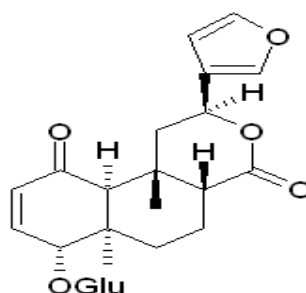
Choline



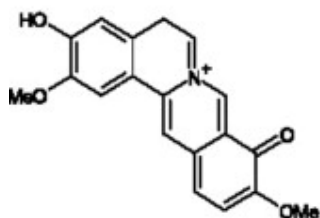
Isocolumbin



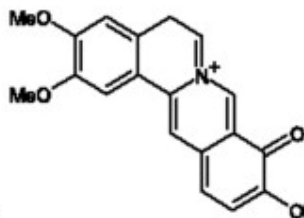
Columbin



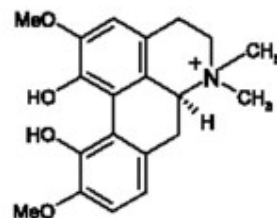
Tinosporasid



Jatrorrhizine

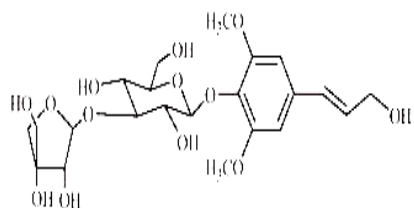


Palmatine

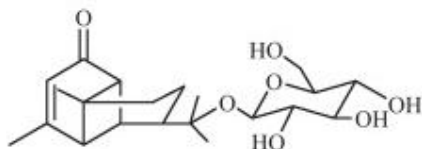


Magnoflorine

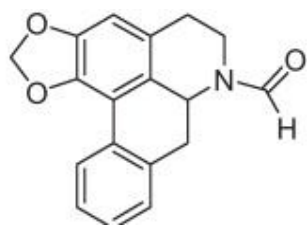
Glycosides



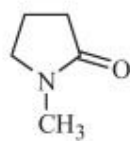
Cordifolioside



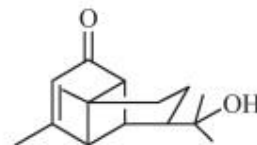
Tinocordiside



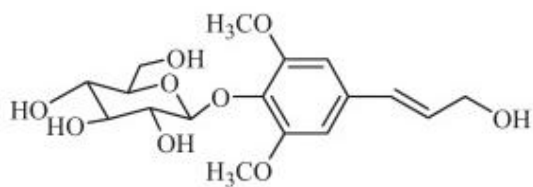
N-Formylannonain



N-Methyl-2-pyrrolidine



H-droxymustakone



Syringin

Table 1: Showing the principle component of each part of the plant

Plant Part	Type of Compound	Active Principle
Root	Alkaloids	Choline, Tinosporin ¹²
	Diterpenoid	Isocolumbin, Palmatine, Tetrahydropalmatine, Magnoflorine
	Lactones	Furanolactone
	Miscellaneous Compounds	Clerodane derivatives, Dihydroxy diepoxy – cleroda, Tinosporin, Tinosporides ²⁷
	Alkaloids	Jatrorrhizine
	Glycosides	Berberine, Palmatine, Tembetarine, Magnoflorine, Choline Norclerodane glucoside, Furanoid diterpene glucoside, Tinocordiside, Tinocordifolioside Syring, Syring-apiosylglycoside, Palmatosides, Crdifolioside A, B, C, D & F ¹³
	Diterpenoids	Furanolactone ²
Stem	Lactones	Clerodane deravative, Dihydroxy diepoxy- cleroda, Tinosporon, Tinosporides, Jateorine, Columbin
	Steroids	B-Sitosterol, Sitosterol, 20 β Hydroxy ecdysone, Makisterone A, Giloinsterol
	Sesquiterpenoid	Tinocordifolin
	Diterpenoids	Furanolactone ^{7,31}
	Lactones	Clerodane derivatives, tinosporon, Tinosporides, Jateorine ¹⁰ , Columbin
	Aliphatic compounds	Octacosanol, Heptacosanol, Nonacosan
Whole Plant	Miscellaneous Compounds	Tinosporidine, Codifol, Cordifellone, Tinosporic acid, Gilonin, Giloin
Aerial Part	Steroids	β -Sitosterol, Sitosterol, 20 β -Hydroxy ecdysone

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