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Review Article

A CRITICAL REVIEW ON *GUDUCHI* (*TINOSPORA CORDIFOLIA* (WILLD.) MIERS) AND ITS MEDICINAL PROPERTIES

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ABSTRACT

All edible things which are used in our food are full of free radicals. So there develops a need to free our body from these free radicals and the things which can help are the natural antioxidants. *Guduchi (Amrita, Giloy)* is the best of them which is abundantly available in all over India. Though almost all of its parts are used in traditional systems of medicines, leaves, stem and roots are the most important parts which are used medicinally. *GUDUCHI* (*Tinospora cordifolia* (Wild.) Miers ex Hook.F. & Thoms.) is a versatile resource for all forms of life. It belongs to family *Menispermaceae*. It contains many different chemicals that affect the body. Some of these chemicals have an antioxidant effect. While other might increases the ability of body's immune system and some chemicals have activity against cancer cells also. The *'Rasayana'* accords longevity, enhance the memory, improve the health, bestows youth, better complexion, voice, energy and lustre the skin. So it is one of the most effective *Rasayana* and rejuvenative. It works well on all the seven dhatus [tissues] and keeps the system in balance. This review gives a bird's eye view on the therapeutic uses of various parts and extract of *T. cordifolia* to enrich our knowledge about this plant.

Key words: *Tinospora cordifolia, Guduchi*, Antioxidant, Antipyretic, Rejuvinator, *Rasayana.*

INTRODUCTION

Guduchi (*Tinospora cordifolia* (Wild.)Miers ex Hook.F. & Thoms.) is one of the non-controversial and extensively used herbs in Ayurvedic medicine. It belongs to family *Menispermaceae.* The World Health Organization reported that 80% of the world population relies chiefly on traditional medicines involving the use of plant extracts or their active constituents. It contains Berberine, Giloin and bitter substances. It acts as antiperiodic, alterative and diuretic. Watery extract of the plant is used as a febrifuge and is called 'Indian quinine'. An infusion prepared from the stem and root is a valuable tonic in debilitating diseases, intermittent fever and dyspepsia[1]

VERNACULAR NAMES

Guduchi (Tinospora cordifolia (Wild.) Miers ex Hook. F. &Thoms.) is commonly known as "*gurcha, giloe, gulancha*" in Hindi, "*guduchi, amrita, somavalli*" in Sanskrit, "gula-vel" in Marathi, "gulancha" in Bengal, "seendal" in tamil, "gilo" in Urdu.[1]

The plant Tinospora cordifolia (Wild.) Miers ex Hook. F. & Thoms. is known as *Guduchi* because it protects body from diseases. It is a rope-like (Tantrika) perennial climber (*Amrta*, *Amrtavallari*) ascending on host in a circular way (*Kundali*, *mandali*). It is generated from stem (*Kandodhbhava*) and when cut, it regenerates (*Chinnaruha*). In transverse section of the stem, a circular structure is seen *(Cakralaksanika).* Its leaves appears like filled with honey *(Madhuparni)* and are eaten by calves *(Vatsadani).* The seeds are semilunar *(Chandrahasa)* which is the basis of the name moon-seed.

Guduchi is a potent drug efficacious in fever *(Jvarnasini)* and well known *Rasayana (Jivanti, Dhara, Rasayana, Vayastha, Vayasya)*. It promotes strength and vitality *(Soma)*, counteracts the poisons *(Visaghni)* and protect from disorders (*Guduchi, Vasalya*).[2]

CLASSICAL REFERANCES

In *VEDA Sounakiya Atharvaveda* and *Panini Upadhi Bhojavrtta Sayana* delineated that Guduchi is kept in every house to avoid snakes and scorpions.

CHARAK has categorized it in *Vayahsthapana, Dahaprasamana, Trishnanigraha, Triptighna, Stanya-shodhana* and also in *Agryadravyas* (principal drugs) by attributing *Grahi, Vatahara, Dipaniya, Kapha-Raktahara* and *Vibandhahara* properties. He also identified it as one of the best *Medhya Rasayanas* (brain tonic). [3.]

SUSHRUTA has mentioned it in *Guducyadi*, *Patoladi, Valli Panchmula, Kakolyadi,* and *Aragvadhadi gana*[4]

Astanga Samgraha has mentioned it into *Guducyadi, Patoladi, Aragvadhadi*.[5]

Description of *Guduchi* is found in almost all *nighantus*. *Dhanvantari nighantu*, *Bhava prakash nighantu* and *Raja nighantu* described it under *Guducyadi Varga*. *Sodhala* included it into *Osadhi Varga.*

BOTANICAL DISCRIPTION

Guduchi grows throughout India in deciduous as well as dry forests. It is said to be climb over the highest trees.

It has two varieties:

(1) *Tinospora cordifolia* Miers *(Menispermum cordifolium Willd.)*
(2) *T. cinensis:* (*T. malabarica* (Lam.) Miers)

(1) *Tinospora cordifolia* Miers *(Menispermum cordifolium Willd.)*

It is a large climber with succulent, corky, and grooved stems; branches posses slender, pendulous fleshy roots.

Figure 1: *Guduchi* heart-shaped leaves

Leaves- membranous, glabrous, 5-10 cm long, cordate; petiole 2.5-7 cm long.

Flowers- in racemes of about 5 cm; axillary, terminal or from the old wood, pale yellowish white in colour.

Figure 2: *Guduchi* fruit is pea-sized red colored on maturity

Fruits- carpels, dorsally convex, ventrally flat, size of a large pea.

(2) *T. cinensis (T. malabarica (Lam.) Miers)*

It is a large climber with 2 cm. diameter stem, old branches are smooth and shining, more or less warty light coloured papery bark, young parts covered with whitish hairs.

Leaves- membranous, sparingly pubescent above, broadly ovate-cordate, 7.5-23 cm long, petiole 6-12 cm. long, striate.

Flowers- arranged in pseudo racemes arising from the old branches, simple, pedunculate, yellowish green coloured.

Fruits- drupes 1-3, scarlet or orange coloured.[6]

DISTRIBUTION

It grows as a climber on small trees and shrubs, both species are distributed almost throughout the India.

It is found in lower valleys in Garhwal up to 900m; also reported from Almorha, Kashipur in Kumaon region. It is fairly common plant of deciduous and dry forests, growing over hedges and small trees.[7]

SUBSTITUTES AND ADULTERANTS

T. cordifolia is substituted or adulterated with other species of Tinospora, viz. T. sinensis (Lour.) Merrill (syn. *T. malaberica* Miers ex Hook. f. and *T. crispa* (Linn.) Miers ex Hook. f. & Thoms.). Although, the microscopical characters of *T. sinensis* resemble that of *T. cordifolia*, there are few characters by which these two species can be

differentiated. The distinguishing characters are as follows.

In *T. cordifolia* the sclerenchymatous sheath becomes disintegrated into scattered irregular patches in the cortical regions whereas in *T. sinensis* it is broken into areas capping the vascular bundle and remains persistent even after further secondary growth. Crystals are absent in *T. cordifolia* while in *T. sinensis* a large crystal of calcium oxalate is present within the lumen of each cork cell. Mucilaginous cells are more in *T. cordifolia* as compared to *T. sinensis*. Vascular strands are fewer in *T. cordifolia* while greater in *T. sinensis* xylem is well developed in each strip of vascular strand in *T. cordifolia* while it is poorly developed in *T. sinensis*. Pith is very narrow and composed of thin walled cells in *T. cordifolia* while it is wide in *T. sinensis*. Starch content is more in *T. cordifolia* as compared to *T. sinensis*.[8]

CHEMICAL CONSTITUENTS

The plant *T. cordifolia* has been subjected to chemical investigations extensively and a number of chemical constituents belonging to the different groups, viz. terpenoids, alkaloids, lignans, steroids have been reported. The plant mainly contains alkaloids, glycosides, steroids, sesquiterpenoid, aliphatic compound, essential oils, mixture of fatty acids and polysaccharides. The alkaloids include berberine, bitter gilonin and non-glycoside gilonin gilosterol. The major phytoconstituent in *Tinospora cordifolia* includes tinosporine, tinosporide, tinosporaside, cordifolide, cordifol, heptacosanol, clerodane furano diterpene, diterpenoid furanolactone tinosporidine, columbin and β-sitosterol. Berberine, palmatine, tembertarine, magniflorine, choline and tinosporin are reported from its stem. A rearranged cadinane sesquiterpene glycoside named tinocordiside, consisting of a tricyclic skeleton with a cyclobutane ring, has been isolated from the immunomodulatory aqueous fraction of the plant. The new clerodane furano-diterpene 2 with the molecular formula C20H 2008 has been isolated from the stems of *Tinospora cordifolia*[9]. *T. cordifolia* contains high fibre (15.9%), sufficient protein (4.5%-11.2%), sufficient carbohydrate (61.66%) and low fat (3.1%). It has high potassium (0.845%), high chromium (0.006%), sufficient iron (0.28%) and sufficient calcium (0.131%) and important in various regulatory functions [10].

GUDUCHI SATTVA

The process of '*Sattva*' (cold water extract) is not traceable in the *Brihat Trayi* text. It is mainly developed during the medieval period. The process involves, crushing of *Guduchi* stems and extracting in the cold water at room temperature (i.e. without heating). After repeated extractions the cold infusion is dried and the obtained solid powder is called as "*Guduchisattva*".[11]

PHARMACOLOGICAL ACTIVITY

- **Anti-Cancer Activities:** *Tinospora cordifolia* shows anti-cancer activity, this activity is mostly shown in animal models. Root extract of *T. cordifolia* has been shown radio protective role due to extensively increase in body weight, tissue weight, tubular diameter. Dichloromethane extracts of TC shows cytotoxic effects owing to lipid peroxidation and release of LDH and decline in GST. [12]
- **Anti-Oxidant Activities:** Methanolic extract of stem of T. cordifolia has been reported to anti-oxidant activity, by increasing the erythrocytes membrane lipid peroxide and catalase activity. It also decreases the activity of SOD, GPx in alloxan induced diabetic rats. Extract of T. cordifolia has been reported its free radical scavenging properties. [13], [14], [15]
- **Anti-toxic Activities:** Aqueous extract of this plant has already been reported to show scavenge activity due to the presence of antioxidant against free radicals generated during aflatoxicosis. Further alkaloids such as choline, tinosporine, isocolumbin, palmetine, tetrahydropalmatine and magnoflorine from T. cordifolia showed protection against aflatoxin induced nephrotoxicity. [16]
- **Immunomodulatory Activities:** A large variety of compounds which are responsible for immunomodulatory and cytotoxic effects are 11- hydroxymuskatone, N-methyle-2-pyrrolidone, Nformylannonain, cordifolioside A, magnoflorine, tinocordioside and syringin. These natural compounds have been reported to improve the phagocytic activity of macrophages, enhancement in nitric acid production by stimulation of splenocyte. [17], [18]
- **Antipyretic activity:** Studies have shown insignificant antipyretic effects in the hexane and chloroform soluble fractions of the stem of *Tinospora cordifolia.*[19]
- **Anti-inflammatory activity:** The water extract of the stem of *Tinospora cordifolia* has been checked for anti-inflammatory activity

in albino rats. It has significantly inhibited acute inflammatory response evoked by carrageenin when administered orally and intraperitoneally.[20]

- **Memory enhancing activity:** Studies have shown that Giloy helps in cognitive enhancement by immunostimulation and synthesis of acetylcholine. Thus contributing in increased choline level which shows that it has memory enhancing property for learning and memory in normal and memorydeficits animals.[21]
- **Anti diabetic activity:** T. cordifolia is widely used in Indian Ayurvedic medicine for treating diabetes mellitus. Oral administration of an aqueous T. cordifolia root extract to alloxan diabetic rats caused a significant reduction in blood glucose and brain lipids. Though the aqueous extract at a dose of 400 mg/kg could elicit significant anti-hyperglycemic effect in different animal models, its effect was equivalent to only one unit/kg of insulin. [22]

AYURVEDIC PROPERTIES AND PHARMACOLOGICAL EFFECT:

According to Ayurveda literature *Guduchi* is *Tikta* (bitter), *Kasaya* (astringent) in *Rasa* (taste), *Guru* (heavy) and *Snigdha* (unctuous) in *Guna* (properties), *Ushna* (hot) in *Virya* (potency) and *Madhura* (sweet) in *Vipaka* (metabolism). But *Kaiydevnighantu* has mentioned *Laghu* (light) *Guna* (properties) in *Guduchi*.[23]

According to *Kaiydevnighantu* and *Bhavprakash*, *Guduchi* is *Katu* (pungent), *Tikta* (bitter), *Kasaya* (astringent) in *Rasa* (taste).[24] [25]

Due to these properties, it alleviates all the three *Doshas* and *Ama* (indigested food). Pharmacological effects of *Guduchi* are *Rasayana* (tissue vitalizer), *Sanghrahini* (absorbent), *Balya* (strength giving) and *Agnidipani* (appetizer). It cures *Trishna* (thirst), *Daha* (burning sensation), *Meha* (urinary disease including glycosuria), *Kasa* (cough), *Pandu* (anemia), *Kamala* (jaundice), *Kustha* (skin diseases), *Vata-rakta* (arthritis with skin lesions), *Jwara* (fever), *Krimi* (worm infestation) and *Vami* (vomiting). It also cure *Prameha* (twenty types of urinary diseases), *Swash* (dyspnoea), *Arsh* (haemorrhoides), *Mutrakricha* (difficulty in micturition), *Hridrog* (cardiac problems) and *Vata* diseases.[26]

Guduchi Sattva is claimed to be a potent tonic and rejuvenator. It is useful in fevers, diarrhoea, urinary tract infections, jaundice, skin diseases, irritable bowel syndrome and defects of semen morphology & spermatogenesis.[27]

MEDICINAL USES

Parts of *Guduchi* medicinally used are stem, leaf and aerial roots. Among the Mundas of chota Nagpur the whole plant, well ground, is applied on fractures.

Stem: It is bitter stomachic, stimulate bile secretion, cause constipation, tonic, allays thirst, fever, burning sensation, vomiting, diuretic, enriches the blood, cure jaundice, useful in skin diseases. The juice is useful in diabetes, vaginal and urethral discharges, low fevers, enlarged spleen and act as a powerful diuretic.

Root: The roots are considered as powerful emetic and are used for visceral obstruction.

Guduchi satvva: The starch obtained from the roots and stems of the plant is similar to Arrow-root in appearance and effect. It answers not only as a remedial medicinal agent in chronic diarrhea and chronic dysentery, but it is also a valuable nutrient, when there is intestinal irritability and inability to digest any kind of food.

Guduchi should be always used fresh for good result and the twiner which grows on *Nimba* tree is said to have better result.[28]

THERAPEUTIC USES

1. Juice of *Guduchi* is highy useful to cure irregular fever (C.S. Chi. 3/299)[29]. Decoction of *Guduchi* mixed with honey can be taken in the morning to cure jaundice (C.S. Chi.16/63)[30]. Syrup of *Guduchi* can also help to remove thirst (C.S. Chi. 22/45)[31]. Decoction of *Guduchi* can also be given in case of Vomiting (C.S. Chi. 20/31)[32]. Oil cooked with *Guduchi* decoction and milk alleviates *Vatarkta* (C.S. Chi. 29/121)[33]. Decoction of *Guduchi* and *Saptaparna* with *Shunthi* can be given for purifying Breast milk (C.S. Chi. 30/261)[34]
2. *Guduchi svarasa* (juice) and *Satavari svaras* in equal parts (10 ml each) are mixed together and given along with *Guda* (jaggery) in *Vataj jvara* (S.S. U. 39/174)[35]. Cold infusion of *Guduchi* mixed with honey is beneficial in all three types of thirst (S.S. U. 49/27). [36]
3. Juice of *Guduchi* mixed with *Pippali* powder also help to remove fever (A.S. Chi. 1/87)[37]. *Ghrita* and oil cooked with juice and paste of *Guduchi, Triphala, Vasa, Draksha* and *Bala* alleviates chronic fever (A.S. Chi. 2/25)[38]

4. Leaves of *Guduchi* should be used as a vegetable in fever (Chakradutta 1/41)[39]. Regular use of *Guduchi* juice mixed with oil destroys filaria (Chakradutta 42/16)[40].
5. The fresh juice of *Guduchi* (20ml twice daily) used as *Medhya* drug (C.S. Chi.1.3/30)[41]
6. Decoction prepared with *Guduchi, Parpat* and *Amalaki* (500ml-100ml) may be administered in case of *Pittajjvara*.[42]
7. *Guduchi svarasa* with honey given in *Prameha* act as a vitalizer (A.H.Chi. 12/6)[43]
8. Leaves of *Guduchi, Nimba and Patola* are made into juice and administered along with honey in *Amlapitta* (B.P. Chi. 10/16)[44]. *Guduchi him Kasaya* may be given orally along with honey in *Chardi* (B.P. Chi. 17/21)[45]. Long administration of *Guduchi* in either juice or paste or powder or decoction form will definitely cure *Vatarakta* (B.P. Chi. 29/41)[46]. In the diseases due to vatadosa it is given with *Ghrita*, in *Pitta dosa* with *Sarkara* and *Kaphadosa* with *Madhu* (B.P. Chi. 29/49)[47]
9. Fresh juice with turmeric powder cures all types of hepatitis within a short period. In filariasis the paste of *Guduchi, Kutaki, Sunthi, Devdaru* and *Vidanga* works well when applied externally. In tubercular fever, its decoction is given with *Ativisa.* The juices of *Guduchi, Amalaki* and *Haridra* act synergistically in urinary problems. In hepatitis, the fresh juice of *Guduchi* given with rock candy, hastens the recovery.[48]
10. The decoction of *Guduchi* and *Sunthi* is a very effective combination for the treatment of gout and rheumatic disorders. It's medicinal ghee with *Kantkari* is beneficial in cough.[49]
11. *Guduchi* juice works well with cow's milk or lodhra in leucorrhea and with cumin seeds in burning sensation due to *Pitta*. In menorrhagia caused by *Vata*, juice of *Guduchi* is highly beneficial[50]
12. Its decoction with *Nimba* and *Vasa* effectively relieves the itching and oozing.[51]
13. The starch (*Sattva*) of *Guduchi* is used for chronic fever, to alleviate it as well as to reduce the burning sensation and to increase the appetite and energy.[52]
14. In indigestion it is given with jaggery and decoction of *Guduchi* and *Triphala* added with *Pippali* powder and honey alleviates all kinds of eye diseases.[53]

CURRENT RESEARCH

- **Hepatic disorders:** In clinical studies 20 patients of infective hepatitis were selected on the basis of clinical and biochemical findings. Four tablets (500mg each) thrice in a day, orally with fresh water were given to the patient for 4 weeks. Comparison between before and after treatment of those patients (N=20) were showed that drug *T. cordifolia* (*Guduchi*) played an important role in relieving the symptoms as well as normalization of altered liver function test.[54][55]
- **Post menopausal syndrome:** Clinical evaluation of a non-hormonal drug Minofil containing *T. cordifolia* along with other plant drugs was done in women of post-menopausal syndrome. Breast discomfort, nausea and fluid retention was observed in 22% (7 cases) with estriol and almost no side effect was observed with minofil. Minofil with short period of therapy and more sustained effect and without side effects is cost effective and may be an alternative to HRT, which is still in controversy. However, long term follow up is required before universal use in post menopausal syndrome.[56]

CONCLUSION

In spite of the overwhelming influences and our dependence on modern medicines and tremendous advances in synthetic drugs, a large segment of the world population still likes drugs of plants origin. Of the 2, 50, 000 higher plant species on earth, more than 80, 000 are medicinal. However, only 7000-7500 species are used for their medicinal values by traditional communities. *Tinospora cordifolia (Guduchi)* is one of the most important medicinal plants used in medicines of *Ayurveda, Siddha, Unani* and homeopathy because of having a number of pharmacological as well as therapeutic properties. Traditionally, this plant is used to treat a huge variety of health problems. Therefore, there is an urgent need to investigate the biological activity of its phytoconstituents for development of an effective, safe and cheap herbal drug.

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