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GUDUCHI (TINOSPORA CORDIFOLIA): A REVIEW OF ITS PHYTOCHEMICAL COMPOSITION AND MEDICINAL PROPERTIES

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ABSTRACT

Guduchi (Tinospora cordifolia), commonly known as Amrita or Giloy, is a versatile medicinal plant that holds a significant position in traditional Ayurvedic medicine. It has been extensively studied for its diverse therapeutic properties, which are attributed to its rich phytochemical composition. Guduchi contains a wide array of bioactive compounds, including alkaloids, diterpenes, glycosides, flavonoids, phenolics, and polysaccharides. These constituents contribute to its various pharmacological activities, such as immunomodulatory, antioxidant, anti-inflammatory, antidiabetic, hepatoprotective, neuroprotective, anti-cancer, and antimicrobial effects. Several studies have reported the immunomodulatory potential of Guduchi, enhancing the immune system's function and protecting against infections.

KEYWORDS: Tinospora cordifolia, Guduchi, Antioxidant, Antipyretic, Rejuvinator.

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. Gulancha, amrita, Giloya, gulvel, and other names have been given to it. The plant family Menispermaceae consists of 70 genes and roughly 450 species found in tropical areas. All parts such as roots, stem, leaves, flower, fruits, and the entire plant of Guduchi have therapeutic value as it contains a variety of phytochemicals with various pharmacological properties. According to the World Health Organisation, 80% of the world's population mostly uses traditional medicines that involve plant extracts or their active ingredients.[1] It is an important drug used by Ayurveda practitioners in various diseased

conditions and also for maintenance of health. A majority of the Ayurvedic lexicons admire the potential health benefits of this drug and compare it to the celestial nectar which brings about immortality, hence the name Amruta is attributed to this. It is a famed rejuvenator and nootropic, used very commonly in treatment of ailments such as fever, diabetes and skin disorders. The antioxidant and anti-inflammatory activities of Guduchi have also been extensively investigated, highlighting its role in combating oxidative stress and reducing inflammation. Moreover, Guduchi demonstrates promising hepatoprotective properties, making it a potential therapeutic agent against liver disorders. It exhibits neuroprotective effects by enhancing cognitive functions and protecting against neurodegenerative diseases. Additionally, Guduchi exhibits antidiabetic activity by regulating blood glucose levels and enhancing insulin secretion. Its anticancer properties have been attributed to its ability to inhibit tumor growth and induce apoptosis in cancer cells. Furthermore, Guduchi possesses antimicrobial properties, inhibiting the growth of various bacteria, viruses, and fungi.

Vernacular Names

ln Latin it is known as Tinospora cordifolia; English known as Gulancha or Indian Tinospora; Sanskrit Madhuparni; Amrita, Guduchi, etc.; Hindi Giloya or Guduchi; In Marathi, it is well known as Gulvel, giroli as well as Amberveli; Assamese Amarlata; Bengali Gulancha, Giloe; Gujrati Galo, Gulo; Tamil Amridavalli; Telugu Tippatige, Guduchi.[2]

Synonyms of Guduchi[3]

Guduchi - That which protect

Amruta - That which can act similar to the celestial

nectar which can make the person immortal.

Chakrangi, Chakralakshanika - Referring to the radiating medullary rays visible on transverse section.

Chinnaruha, Chinnodbhava - Referring to its propagation by stem cuttings.

Taxonomical Classification

Guduchi comes under the Kingdome Plantae (Plant) Division is Magnoliophyta (Flowering), Class Magnoliopsida (Dicotyledons), the order is Ranunculales, and it belongs to Menispermaceae family (The moonseed family), Tribe Tinosporeace, Genus Tinospora and species is cordifolia.[4]

CLASSICAL REFERANCES

CHARAK has categorized it in Vayahsthapana, Dahaprasamana, Trishnanigraha, Triptighna, Stanya-shodhana and also inAgryadravyas (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).[5]

SUSHRUTA has mentioned it in Guducyadi, Patoladi, Valli Panchmula, Kakolyadi, and Aragvadhadi gana.[6]

Astanga Samgraha has mentioned it into Guducyadi, Patoladi, Aragvadhadi.[7]

BOTANICAL DISCRIPTION[8]

It is a large, deciduous extensively spreading climbing shrub with several elongated twining branches, Leaves simple, alternate, exstipulate, long petioles up to 15cm long, roundish, pulvinate, both at the base and apex with the basal one longer and twisted partially and half way around. lamina 10–20 cm long or 8–15 cm broad, 7 nerved and profoundly cordate at base. Unisexual, petite, greenish yellow flowers on axillary and terminal racemes that develop on different plants when they are leafless. Female flowers often alone, male flowers together. Sepals 6, free in two series of three each, the outer ones are smaller than the inner. Petals 6 free smaller than sepals, obovate and membranous. Fruits aggregate of 1-3, ovoid smooth drupelets on thick stalk with sub terminal style scars, scarlet or orange coloured.

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 ofdeciduous and dry forests, growing over hedges and small trees.[9]

Photochemistry

The plant mainly contains alkaloids, glycosides, steroids, sesquiterpenoid, aliphatic compound, essential oils, mixture of fatty acids and polysaccharides. The alkaloids include bitter gilonin, non-glycoside gilonin, and gilosterol, among others. Tinospora's primary phytonutrient.

Tinosporine, tinosporide, tinosporaside, cordifolide, cordifol, heptacosanol, clerodane furano diterpene, diterpenoid furanolactone tinosporidine, columbin, and beta-sitosterol are all components of cordifolia. From its stem, berberine, palmatine, tembertarine, magniflorine, choline, and tinosporin have been found. Tinocordiside, a rearranged cadinane sesquiterpene glycoside with a cyclobutane ring and tricyclic structure, has been discovered in the immunomodulatory aqueous fraction of the plant. Tinospora cordifoliastems were used to extract the novel clerodane furano-diterpene 2 with the molecular formula C20H2008. (10)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.[11]

PHARMACOLOGICAL ACTIVITY

Giloy, is a well-known medicinal plant in Ayurveda, the traditional Indian system of medicine. It has been used for centuries for its various pharmacological activities and health benefits. Here are some of the key pharmacological activities associated with guduchi:

1) Immunomodulatory activity: Guduchi is known for its immunomodulatory properties, which means it helps to regulate and strengthen the immune system. It enhances the activity of immune cells, such as macrophages and lymphocytes, which play a vital role in defending the body against infections and diseases.[12]
2) Antioxidant activity: Guduchi exhibits potent antioxidant properties, which help to scavenge harmful free radicals and reduce oxidative stress in the body. Oxidative stress is known to contribute to various diseases and aging processes, and the antioxidant activity of guduchi helps protect against these harmful effects.[13]
3) Anti-inflammatory activity: Guduchi possesses significant anti-inflammatory properties. It inhibits the release of inflammatory mediators and reduces the production of pro-inflammatory cytokines, thereby alleviating inflammation. This activity is beneficial in managing various inflammatory conditions such as arthritis, asthma, and skin disorders.[14]

4) Hepatoprotective activity: Guduchi has hepatoprotective or liver-protecting properties. It helps in the regeneration of liver cells and protects the liver against damage caused by toxins, drugs, and alcohol. It also aids in the management of liver disorders like hepatitis and fatty liver disease.
5) Anticancer activity: Several studies have indicated that guduchi exhibits potential anticancer activity. It has been shown to inhibit the growth of cancer cells and induce apoptosis (programmed cell death) in various types of cancer, including breast, lung, and liver cancers. However, more research is needed in this area.
6) Antidiabetic activity: Guduchi has demonstrated antidiabetic effects by reducing blood glucose levels. It helps in improving insulin secretion, enhancing insulin sensitivity, and reducing insulin resistance. These properties make it beneficial in managing diabetes and its complications.[15]
7) Antimicrobial activity: Guduchi possesses antimicrobial properties, which make it effective against a range of pathogens, including bacteria, viruses, and fungi. It has shown inhibitory effects against common pathogens such as Staphylococcus aureus, Escherichia coli, and Candida albicans.
8) Neuroprotective activity: Guduchi exhibits neuroprotective properties that help protect the brain and nervous system. It has been found to reduce oxidative stress, inhibit inflammation, and enhance cognitive functions. These effects make it potentially beneficial in managing neurodegenerative diseases like Alzheimer's and Parkinson's.
9) Antistress activity: Guduchi is considered an adaptogen, meaning it helps the body adapt to stress and promotes overall well-being. It helps in reducing stress-related symptoms, improving energy levels, and boosting vitality.

AYURVEDIC PROPERTIES AND PHARMACOLOGICAL EFFECT

According to Ayurveda literature Guduchiis 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.[16]

According to Kaiydevnighantu and Bhavprakash, Guduchi is Katu (pungent), Tikta(bitter), Kasaya (astringent) in Rasa (taste). 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.[17]

DISCUSSION

A few therapeutic applications as mentioned in classical literature:

1. Jvara (~Fever)

1. Decoction of the cold infusion of Guduchi should be taken.
2. Juice of Guduchi and Shatavari in equal quantity mixed with jaggery alleviates fever caused by Vata.
3. Guduchi juice alone checks fever caused by vata (~one of the three bodily humors).
4. The juice of Guduchi mixed with Pippali checks fever.
5. Cold infusion of Guduchi mixed with sugar alleviates fever caused by pitta (~one of the three bodily humors).
6. Decoction of Guduchi, Parpata and Amalaki overcomes fever caused by pitta.18
7. Oil prepared with powder of Katuki (Picrorhiza kurroa Royle ex Benth) or leaves of Guduchi or Sahadevi (Sida rhombifolia L.) juice alleviates fever.

2. Vishama Jvara (~Fever of irregular pattern)

1. Decoction of Triphala (Combination of three fruits viz. Terminalia chebula, Terminalia bellerica and Emblica officinalis) or juice of Guduchi is useful.
2. One should take the decoction of Guduchi, Nimba (Azadirachta indica A. Juss) and Amalaki(Emblica officinalis Gaertn) mixed with honey.

3. Jirna Jwara (~Chronic fever)

1. Ghrita (Medicated ghee) and oil (Medicinal oil) prepared with juice and paste of Guduchi, Triphala, Vasa (Justicia adhatoda L), Draksha (Vitis vinifera L.) and Bala (Sida cordifolia L.) alleviate fever.
2. Decoction of Guduchi added with Pippali (Piper longum L.) powder destroys chronic fever and Kapha (~one of the three bodily humors).
3. Cold infusion of Guduchi alleviates chronic fever.

4. One should use Guduchi juice mixed with Pippali powder and honey to treat chronic fever, spleen enlargement, cough and anorexia.
5. In case of vomiting in fever, cold decoction of Guduchi mixed with honey should be taken.
6. The leaves of Guduchi should be used as vegetables in fever.

4. Kamala (~Jaundice) and Halimaka (~Hepatitis)

1. One suffering from jaundice should take buffalo's ghee processed with Guduchi juice and milk.
2. The patient of jaundice should take decoction of Triphala or Guduchi or Daruharidra (Berberis aristata) or Nimba mixed with honey in the morning.

5. Chardi (~Vomiting)

1. In case of vomiting, a decoction of Guduchi should be taken.
2. Decoction of Guduchi, Triphala, Nimba and Patola (Tricosanthes dioicia Roxb.) mixed with honey and sugar alleviates vomiting and Amplapitta (Hyperacidity).
3. Cold infusion of Guduchi mixed with honey checks severe vomiting caused by three doshas.

6. Amlapitta (~Hyperacidity)

- Decoction of Guduchi, Nimba and Patola leaves mixed with honey alleviates Amlapitta.

IMPORTANT FORMULATIONS

1. Amritarishta.
2. Amritottara Kvatha Churna.
3. Guduchi sattva.
4. Chinnodbhavadi Kvatha Churna.
5. Kaishora Guggulu.
6. Guduchyadi Taila.
7. Brihat Guduchi Taila.

CONCLUSION

Even-though, there are many herbal plants in the world, Guduchi is considered to be having greater medicinal value. The pharmacological actions attributed to Tinospora cordifolia in Ayurvedic texts have evidences suggesting that this drug has immense potential in modern

pharmaco-therapeutics. Guduchi is known for its immunomodulatory, antioxidant, anti-inflammatory, hepatoprotective, anticancer, antidiabetic, antimicrobial, neuroprotective, and antistress activities. These properties make it potentially useful in managing various conditions such as immune disorders, oxidative stress-related diseases, inflammation, liver disorders, diabetes, cancer, microbial infections, neurodegenerative diseases, and stress-related symptoms. 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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