

# Amrita: The ancient herb with modern healing potential and safety features

## Abstract

*Tinospora cordifolia* Willd commonly known, as “Amrita” or “Guduchi”, is a large deciduous, extensively spreading climbing shrub with several coiling branches, a dioecious medicinal herb. It is designated as *Rasayana* in Ayurveda as it enhances general body resistance and promotes longevity, an anti-stress, adaptogen, and a potential plant for providing resistance against infections. The plant is well known as Indian bitter and is generally prescribed for fever, diabetes, dyspepsia, jaundice, urinary problems, skin diseases, gastrointestinal diseases including dyspepsia, flatulence, gastritis, jaundice, chronic diarrhea and dysentery, splenomegaly, and hemorrhoids. The herb has been reported to be significant for the management of cardiovascular diseases (CVDs), and the treatment of leprosy, helminthiasis, and rheumatoid arthritis. Some of the most significant formulations in which Guduchi is prime ingredient are Guduchyadi churn, Guduchi taila, Dashmoolarishtha, Sanjivani vati, Punchnimba churana, Guduchi ghrita, Amritaguggulu, Amritashtaka churna, Kantakari avaleha, Chyavanaprasha, Guduchi sattva, Brihat guduchi taila, Stanyashodhana kashaya churana. The most dominant constituents in guduchi include terpenoids, alkaloids, tannins, cardiac glycosides, flavonoids, saponins, lignans, steroids, C<sub>6</sub>-C<sub>3</sub> derivatives and polysaccharides along with other components. There are no adverse effects of any kind reported so far as prescribed under reasonable dose application. It has promising potential as a tonic in infants and stimulates immunity in children besides facilitating growth. Due to the presence of immense medicinal properties, this plant has been over-exploited by pharmaceutical companies and folk people for traditional remedies. This in turn has led to the acute scarcity of this plant. Therefore, it is of prime importance and urgent need for its conservation.

**Keywords:** amrita, adaptogen, anti-stress, immunomodulator, rasayana, *Tinospora cordifolia*

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## Introduction

*Tinospora cordifolia* Willd. (Family: Menispermaceae, Figure 1) commonly known, as “Amrita” or “Guduchi”, is a large deciduous, extensively spreading climbing shrub with several coiling branches, a dioecious medicinal herb. It is disseminated all over the tropical area of India up to an altitude of 1,200 m from sea level starting from Uttarakhand to the Northeast region of Arunachal, Assam, Meghalaya, extending through West Bengal, Bihar, South part of the country including Kerala and Karnataka. It is an equally important common deciduous plant of dry forests, growing over trees, shrubs, and hedges.<sup>1</sup>



**Figure 1** *Tinospora cordifolia* (Amrita, Guduchi) depicting stem, leaves and fruits.

In Ayurveda, it is designated as *Rasayana* and is recommended to enhance general body resistance and promote longevity, an anti-

stress, adaptogen and potential plant for improving the immune system and providing resistance against infections.<sup>2</sup> The Ayurvedic system of traditional medicine describes *T. cordifolia* as bitter, pungent and astringent in taste. Its bitter sense of taste is responsible for improving metabolic efficacy, in cells. The drug is well known as Indian bitter and is generally prescribed in fever, diabetes, dyspepsia, jaundice, urinary problems, skin diseases, gastrointestinal diseases including dyspepsia, flatulence, gastritis, jaundice, chronic diarrhea and dysentery, splenomegaly, and hemorrhoids. The herb has been reported of significant importance for the management of cardiovascular diseases (CVDs), treatment of leprosy,<sup>3</sup> helminthiasis and rheumatoid arthritis. It protects and supports the immune system, prevents upper respiratory tract infections, lower oral ulcer, promising as adjuvant therapy in cancer and protects liver. It also has a role in the treatment of metabolic disorders such as diabetes and kidney disorders.<sup>3</sup>

Scientific studies have emphasized the possible uses of *T. cordifolia* in modern medicine as anti-diabetic, anti-cancer, immunomodulatory, antioxidant, antimicrobial, anti-inflammation, anti-toxic, anti-osteoporosis, and immune-stimulation activities.<sup>4</sup> The carbohydrate ingredient, starch attained from the stem popularly recognized as “*Guduchi-satva*” is extremely effective in treating digestive problems and also found useful in several other diseases. It has been found that female *Guduchi* have higher amounts of active secondary metabolites and are superior in antioxidant potential as compared to its male plant.<sup>4</sup>

## Uses in traditional indigenous systems of medicine

The Ayurvedic drug Guduchi or Amrita is mentioned in various classical texts of the Ayurvedic System of Medicine. Numerous Ayurveda scripts and Nighantus (Materia medica and Lexicons) have pronounced it as an anti-diabetic agent under several designations like Pramehaghna, Pramehahara, Mehaghna, and Mehahara. The important text of *Sushurta Samhita*, revealed it beneath “Tikta-Saka Varga” and appealed beneficial for considering in Kustha (leprosy), Maha-jvara (a kind of fever), Svasa (asthma) and Aruchi (anorexia), in *Charak Samhita* and *Ashtanga Hridaya*, it has been indicated in Kamala (jaundice), Jvara (fever) and Vat Rakta (gout).<sup>5</sup> Further, another valuable text of *Bhava Prakash* also deliberated about its important action as a potent aphrodisiac, bitter tonic, astringent, diuretic, and remedial in contradiction of skin impurities, jaundice, diabetes dysentery, and chronic diarrhea.<sup>5</sup>

The *Dhanvantari Nighantu*, described the medicinal value in the treatment of bleeding piles, stimulating permanence, therapeutic effect in itching, erysipelas as a tonic, rejuvenator, in diarrhea, cold fevers, urinary infections, skin disease, and irritability of the stomach. According to traditional Ayurvedic practitioners, the *Guduchi Satva* acquired from the stem of the Guduchi plant growing on Neem tree (*Azadirachta indica*) is bitterer and more efficacious. Furthermore, scientific literature describes that *T. cordifolia* is of prime importance and a main source of constituent of several compound formulations used in general debility, dyspepsia, fever, and urinary diseases.<sup>6</sup>

## Important traditional formulations of guduchi

Some of the most significant formulations in which Guduchi is prime ingredient are: Guduchyadi churna, Guduchi taila, Dashmoolarishtha, Sanjivani vati, Punchnimba churana, Guduchi ghrita, Amritaguggulu, Amritashtaka churana, Kantakari avaleha, Chyavanaprasha, Guduchi sattva, Brihat guduchi taila, Stanyashodhana kashaya churana, etc. In Unani System of Treatment, frequently “Sat Giloe” is combined in various prescriptions. “Arq Giloe” organised by using fresh plant is well-thought-out as febrifuge, while “Arq Maul Laham Makokashiwala” is a general tonic.<sup>5</sup>

## Practises of guduchi in conventional and ethnic medicine

*T. cordifolia* is of prime importance and has a superior comment for its prominence in tribal and folk lore medicine all over the world. The tribals Baiga, living in the interior areas of Naugarh and Chakia Block of Varanasi district, Uttar Pradesh make the paste of the stem of Guduchi (*T. cordifolia*) and the roots of Bhatkatiaya (*Solanum surattense*) and use to treat fever.

The tribals and fishermen along the seacoast of Maharashtra of Mumbai region and its adjoining areas use *T. cordifolia* herb to treat jaundice, fever, chronic diarrhoea, and dysentery.<sup>7</sup> In the area of Khedbrahma region of North Gujarat tribal people use this herb in their daily life for food and as medicine. These tribal peoples use the powder of root and stem bark of *T. cordifolia* with milk for the treatment of cancer; decoction of the root is used for the cure of dysentery, diarrhoea, and periodic fever. Decoction of the stem is administered orally by the people of Bhubaneswar (Orissa), Patiala (Punjab), Jammu (J & K), and Bagwada (Rajasthan) for the treatment of fever. The local women of Arjunpura (Rajasthan) prepare an adhesive paste of Guduchi (*T. cordifolia*) and 5 seeds of Krishna marich (*Piper nigrum*) and administer it orally once daily in the morning to treat rakta pradur (leucorrhoea) in females.<sup>7</sup>

## Synergistic combinations of amrita/guduchi

Classic prescriptions of genus *Tinospora* in traditional and clinical usages as decoction of *T. cordifolia*, *Berberis aristata*, *Terminalia chebula* and *Zingiber officinale* in amoebic liver abscess; decoction of *T. cordifolia*, *Phyllanthus niruri*, *Terminalia belerica*, *Terminalia chebula* and *Phyllanthus emblica* in hepatotoxicity; decoction of *T. cordifolia* is highly effective to treat diabetic foot, jaundice, ulcers, tuberculosis, sepsis, breast cancer; *T. cordifolia* decoction *Zingiber officinale*, *Withania somnifera*, *Tribulus terrestris* in treatment of rheumatoid arthritis.<sup>8</sup>

This important herb has been extensively studied by Scientists throughout the world for its chemical constituents and their biological activities that revealed its pharmacological functions in crude extracts and efficacy of purified compounds as anti-diabetic, antioxidant, antitumor, anti-inflammatory, anti-microbial, anti-fungal, anti-osteoporosis and immune stimulation.<sup>9</sup>

## Chemical constituents

More than 225 chemical constituents have been reported from the genus *Tinospora*, and diterpenoids are the most dominant constituents, including terpenoids, alkaloids, tannins, cardiac glycosides, flavonoids, saponins, lignans, steroids, C<sub>6</sub>-C<sub>3</sub> derivatives and polysaccharides along with other components. The presence of polysaccharides in the genus *Tinospora* contributes to its strong immune-enhancing ability and relatively low toxicity.<sup>10</sup>

## The list of the active chemical constituent reported in genus *Tinospora* so far are:

- **Terpenoids (whole plant):** Tinosporide, Furanolactone diterpene, Furanolactone clerodane diterpene, furanoid diterpene, Tinosporaside, ecdysterone makisterone, and several glucosides isolated as poly acetate, phenylpropene disaccharides cordifolioside A, B and C, cordifolioside D and E, Tinocordioside, cordioside, palmatosides C and F, Sesquiterpene glucoside tinocordifolioside, Sesquiterpene tinocordifolin.<sup>11</sup>
- **Alkaloids (stem & roots):** Tinosporine, Magnoflorine, Tembetarine, Berberine, Choline, Palmatine, Jatrorrhizine, 1,2-Substituted pyrrolidine, Alkaloids, viz. jatrorrhizine, palmatine, beberine, tembetarine, choline.<sup>12</sup>
- **Glycosides (stem):** 18-norclerodane glucoside, Furanoid diterpene glucoside, Tinocordioside, Tinocordifolioside, Cordioside, Cordifolioside, Syringin, Syringin-apiosylglycoside, Pregnane glycoside, Palmatosides, Cordifolioside A, B, C, D & E.<sup>13</sup>
- **Lignans (whole plant):** 3(a, 4-dihydroxy-3-methoxybenzyl)-4-(4-hydroxy-3-methoxybenzyl).<sup>13</sup>
- **Steroids (shoot):** Giloinsterol, β-Sitosterol, 20a-Hydroxy ecdysone, δ-sitosterol, 20 β-hydroxyecdysone, Ecdysterone, Makisterone A, Giloinsterol.<sup>10,11</sup>
- **Others (root, whole plant):** Giloin, Giloinin, Tinosporan acetate, Tinosporic acid, Tinosporal acetate, Tinosporidine, Heptacosanol, Cordifolone, Octacosanol, Tinosponone, Tinosporic acid, tinosporal, tinosporon, 20-hydroxyecdysone, two phytoecdysones, an immunomodulatory and dynamic arabinogalactan.<sup>11</sup>

These chemical constituents present in *Tinospora cordifolia* are the potential source of new therapeutic strategies for both infectious and non-infectious diseases.

## Standards parameters for identity and purity

The authentic Giloy should not contain foreign matter less than 2.0%; total ash should also be less than 7.0%; acid-soluble ash not less than 0.8%; ethanol-soluble extractive not less than 6.0%; loss on drying not more than 7.5%; lead (Pb) not more than 10 ppm; arsenic (As) not more than 2 ppm; heavy metals not more than 20 ppm; total bacterial count not more than 3000 CFU/gm; yeasts and molds not more than 100 CFU/gm; bitters content not less than 3% w/w on the dry basis by Gravimeter/HPTLC.<sup>14</sup>

## Pharmacognostic description

**The diagnostic pharmacognostic characteristics of Amrita (*Tinospora cordifolia*) are as follows:**

**Stem:** The Stem of the herb is succulent with long, filiform, fleshy, and climbing in nature. Stem is characterized by the presence of bi-collateral vascular bundles surrounded by pericyclic fibers. The bark is grey to creamy white in color with a deep left spiral twisted. The cork arises in the sub-epidermal layers and gives rise to 2-3 layers of cork. Starch an ingredient of significant importance exists all over the parenchyma of the stem. The plant has aerial roots arising all over the stem from the branches (Figure 1).

**Root:** The roots are aerial and are categorized as employing tetra- to penta-arch crucial organization. The cortex is distributed between thick outer wall regions of an inner parenchymatous area consisting of secretory channels. The starch contents are distributed all over the parenchymatous area of the aerial root system. The shape of starch particles is elliptical or ovate in shape and design, generally modest but in rare case the grains of the compound comprising 2 to 5 grains in a component, by means of faint marking as concentric corrugation and significant hilum like appearance at some main points.<sup>15</sup>

**Leaf:** Leaves of this plant are simple, alternate, ex-stipulate, with long petioles approximately 15 cm, round, pulvinate, heart-shaped (Figure 1), halfway round, and partially twisted with multicoated reticulate venation. Lamina is oval shape, ranging 10-25 cm in length, with well-defined nerved and deep cordate system at base and like membranous.<sup>16</sup>

The transverse section petiole is more or less circular in outlines, without trichomes. In cross section it showed a single layered epidermis followed by wide zone of cortex comprising 3 to 4 layers of endodermis tissues. The vascular bundles comprise of radial rows of xylem and a few rows of cambium cells on outer side shadowed by phloem. The cross section of lamina shows a dorsi-ventral structure with its mesophyll differentiated into palisade and spongy tissue. Glandular hairs are present in lower surface and are unicellular and slightly in club fashioned.<sup>16</sup>

**Flowers:** Flowering occurs during March to June, are greenish yellow in color, racemes, unisexual, appears when plant leaves number are less and density. Male flowers are cluster form and female flowers inflorescence occurs in solitary form. Sepals of flowers are 6 in number and 2 series comprising 3 in each set. Flowers of outer side in bunch are smaller than the sepals of inner circles. The number of petals is also 6, but smaller in size as compared to sepals, free and in membranous forms.<sup>5</sup>

**Fruits:** Fruits (Figure 1) develop during winter, orange red in color ovoid, fleshy, smooth, aggregate to 1-3, drupelets on the thick stalk with subterminal style scars.<sup>16</sup>

**Seeds:** Seeds are curved in shape and have been described in this herbal species henceforth mentioned under the family as moonseed family.

Furthermore, the endocarp of seed is variously in ornamental form and provides a significant feature for its taxonomic classification.<sup>1</sup>

## Growth requirement

The plant is extremely strong, and firm and may be grown in any type of soil and almost every climate but prefers warm weather. *T. cordifolia* prefers medium black or red soil for better agronomy and growth. However, it may be magnificently grown in enormous variability of soils, extending from sandy to loam clay. Nevertheless, the soil must be well drained having appropriate moisture and rich in organic matter for good growth.<sup>17</sup>

The multiplication and planting are commonly done during the rainy season July to August. It is climber in nature hence requires support for normal growth. This is a Reckless growing species and plants like Moringa (*Moringa oleifera*), Neem (*Azadirachta indica*), and Jatropha (*Jatropha curcas*) are being planted to provide support during growth. It has been observed and said that *T. cordifolia* (Giloy) growing on Neem (*Azadirachta indica*) support is named NEEM GILOY with a phytochemical configuration very similar to neem and shows higher therapeutic action.<sup>17</sup>

## Limitations of growing

*T. cordifolia* can be propagated by seeds but it is preferred through vegetative cuttings of stem. However, both ways are not suitable for large-scale production and have problems with traditional methods of propagation. The viability of seeds is very low, and poor seed set and germination of seeds are the main problems associated with its clonal propagation. Thus, vegetative cuttings are more suitable for its further propagation.<sup>18</sup>

## Threats to amrita

Due to the presence of immense medicinal properties, this plant has been over-exploited by pharma companies and folk people for traditional remedies have led to the acute scarcity of this plant to meet the present-day demand. Due to high commercial demand, *T. cordifolia* has been identified and listed among 29 extremely ranked herbs used as medicinal plants in different agro-climatic zones 8 (Rajasthan, U.P. and M.P.). It also listed in 178 medicinal plant species in high Volume Trade of India by National Medicinal Plant Board (NMPB), New Delhi, Government of India.

## Safety aspects of amrita

The drug Guduchi or Amrita consists of dried pieces of the mature stem of *Tinospora cordifolia* its roots and leaves also have medicinal value. The clinical actuality of this herb from the genus *Tinospora* in several countries all over the world supports confirmations about therapeutic effectiveness. There are no adverse effects of any kind reported so far as prescribed under reasonable dose application. It has promising potential as a tonic in infants and stimulates immunity in children besides facilitating growth. To study toxicity in terms of LD<sub>50</sub> value for *T. cordifolia* is much more than 1 g/kg for oral administration acute toxicity at 3 g/kg demonstrating that it is safe without any side effects as no death in experimental rats.<sup>19</sup>

## Therapeutic commercial products of amrita and their claimed health benefits

- **Guduchi (*Tinospora cordifolia*) pellets-** suggested for several diseases for the buildup of the immune system and the body's resistance to infections.
- **Abhaibhubejhr-anti-Stress**



- **Safe herb** -anemia and sexual disabilities.
- **Brave heart capsule**- It lowers the lipid levels especially cholesterol and LDL cholesterol in body, diuretic
- **Cirrholiv capsules**-hepatoprotective
- **Cirrholiv-ds syrup**- hepatoprotective
- **Mussaffen**-blood purifier and anti-allergic
- **Madhu Mehari** -cures urinary problems, maintain blood sugar, fatigue
- **Tonplex**-increase immunity
- **Rebuild**-anti-stress, anti-oxidant

## Conclusion and future prospects

According to the latest estimate, there are about eight thousand licensed pharmacies of Indian Systems of Medicine in the country, engaged in the manufacture of drugs to meet the requirement of people. The total annual requirement of the raw materials of these pharmacies was estimated in several tones.<sup>5</sup> Now, the cumulative demand is achieved by the collection of this herb from its usual environment and/or uprooting plants/shoots/leaves on nominal charges or by illegal cuttings.

This plant species has huge therapeutic potential; it has been over-exploited by human activities and therefore, it is of prime importance and urgent need for conservation. Plant tissue culture techniques are the alternative method to rapid propagation of this plant for its conservation and the enhancement of secondary products.

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## Conflicts of interest

There is no conflict of interest in this research work.

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