



# Assessment On Properties Of Guduchi As Anti-Infective & Immune Booster – In-Vitro Study

Pranita S. Kavitate<sup>1</sup>, Kirankumar S.Shinde<sup>2\*</sup>, Avishkar H. Sawant<sup>3</sup>

Department Of Quality Assurance

JBVP's Vidya Niketan College of Pharmacy Lakhewadi. Tal. Indapur, Dist. Pune. 413103

**Abstract :** *T. Cordifolia* (Guduchi) is a large, glabrous, perennial, deciduous, climbing shrub of weak and fleshy stem found throughout India. It is a widely used plant in folk and Ayurvedic system of medicine. *Tinospora cordifolia* belonging to the genus *Tinospora* is commonly known as Guduchi or Giloe. The Guduchi Plant is used in ayurvedic, "Rasayanas" to improve the immune system and the body resistance infections. *Tinospora cordifolia* is widely used in ayurvedic medicine for the treatment of various ailments. It contains many different chemicals that affect the body. Anti-infectives are medicines that work to prevent or treat infections, they include antibacterials, antivirals, antifungals and antiparasitic medications is known as Anti-infective. Anti-infectives have revolutionized healthcare and are now critical in curing and even helping to prevent many kinds of infection. Treat minor infections and most often cure many serious infectious diseases, like pneumonia or tuberculosis, Perform routine procedures and complex surgery, such as cesarean sections or joint replacements, which carry a risk of serious infection, Give vital immuno-suppressive treatments, like chemotherapy, to people with cancer. Numerous pharmacology studies have demonstrated that *T. cordifolia* modulates key signaling pathways related to cell proliferation, inflammation, and immunomodulation. In addition to proper nutrition and exercise, health-conscious consumers are seeking natural-based modalities, e.g. botanical preparations, that positively impact the immune system. This review brings together various properties and medicinal uses of *T. cordifolia* described in Ayurveda, along with phytochemical and pharmacological reports. Allergic conditions, jaundice, cardiovascular diseases, rheumatoid arthritis, poisoning, and microbial infections. *T. cordifolia* has a many bioactive phytochemicals that have been isolated from its aerial parts and roots.

**Index Terms** - *T.cordifolia*, *Tinospora*, Guduchi, Immunity

## I.Introduction :

Guduchi is coined as 'Amritavalli' which literally translates into a creeper with heavenly nectar'. According to the Hindu mythological legend of Ramayana. *Tinospora cordifolia* (common names heart-leaved moonseed, guduchi or giloy, among others. The guduchi plant is called as Amrita or Indian bitter. It is used to manage fever occurring due to malaria, dengue and swine flu. The anti-inflammatory property of Guduchi makes it valuable in decreasing respiratory problems such as recurrent cold and cough, asthma and tonsil infection. We present the first clinical evidence of HIF-1 reduction in COVID-19 patients receiving AV herbal extract treatment. Our study concluded that the use of oral medication of Vasa ghan, Guduchi ghan, and Vasa Guduchi ghan are effective treatment for mild COVID-19 patients. there is an increasing trend in the number of infectious and non-infectious diseases due to various predisposing factors viz., the unhealthy dietary habits, stress, work pressure, change in climate, rising antimicrobial resistance in microbial pathogens and others.



**Figure 1:** Guduchi in india

Synonyms- Chakralakshanika, Amrita

Kingdom- Plantae

Clade- Tracheophytes

Order- Ranunculales

Family- Menispermaceae

Genus- Tinospora

Species- T. Cordifolia

It is commonly named as Bengali: giloe, Gujarati: galo, Hindi: giloy, Tamil: amrida valli, Telugu: tippa teega, Malayalam: sittamrytu, Marathi: ambarvel English: Gulancha tinospora,

## II. Ayurvedic Properties Of Guduchi :

Rasa (Taste) – Kashaya (astringent), Katu (pungent) and Tikta (bitter)

Guna (Quality) – Guru (heavy) and Snigdha (unctuous)

Ushna (Potency) – Ushna (heating energy)

Vipaka (Resultant Effect) – Madhura Vipaka (sweet post-digestive effect)

Prabhav (Therapeutic Effect) – Rejuvenative, Immunomodulator and Adaptogen

Effects on Organs - Stomach, Intestines, Liver, Heart, Blood, Skin

**Table 1: Ayurvedic properties (dravya-guna) of T. cordifolia (Guduchi)<sup>(5-8)</sup>**

Rasa	Guna	Virya	Vipaka	Prabhava
Tikta, Kasaya	Laghu, Guru, Snigdha	Ushna	Madhura	Vishaghna
Bitter, Astringent	Light, Heavy, Unctuous	Hot potency	Neutral	Anti-toxic

Rasa: Taste appreciation of the substances by chemical receptors on tongue; sweet, sour, salt, bitter, pungent and astringent, Guna: Ten pairs of opposite or mirror image attributes; attribute or property of any substance, Virya: potency; ushna- hot, sheeta- cold, Vipaka: Intestinal digestion and tissue metabolism; madhura- neutral, amla- acidic, katu- alkaline, Prabhava: Specific action through specialized receptors

## III. Ways To Take Different Forms Of Guduchi :

Guduchi Churna: ½ tsp of the herb powder, with honey or lukewarm water preferably after meals twice a day

Guduchi Juice: 2-3 tsp of the juice with water before meals once or twice a day

Guduchi Stem Juice: 1-2 tbsp of the juice extracted from the stem infused with honey twice a day after meals

Guduchi Kwath: 2-3 tbsp of the decoction obtained from the herb, twice a day before or after lunch and dinner

Guduchi Vati: 1-2 tablets /capsules formulated using the herb, twice a day with water after meals.

#### IV. Morphological features :

- Gurcha is a gregarious glabrous, twiner.
- Older stems are up to 2 cm in diameter and have corky bark.
- Aerial roots arise from nodal scars of branches.
- Stem and branches are specked with white vertical lenticels.
- Bark is grey-brown or creamy white, warty, papery thin, and peels off easily.
- Leaves are 5–15 cm, ovate, and acute.
- They are membranous when young but become more or less leathery with age.

#### V. Chemical composition :

The chemical constituents of *T. cordifolia* belong to different classes such as alkaloids, glycosides, steroids, phenolics, aliphatic compounds, polysaccharides, leaves are rich in protein (11.2%), calcium and phosphorus [22]. The stem contains clerodane furano diterpene glucoside (amritoside A, B, C, and D) and the structure has been established by different spectroscopic studies [23, 24, 25].

Part	Chemical type	Active principle	Ref.	
Stem	Alkaloids	Berberine, palmatine D, choline D, tinosporine, Magnoflorine, tetrahydropalmatine, isocolumbin	133-138	
		18-norclerodane glycoside	139	
	Glycosides	Furanoid diterpene glycoside	140-141	
			Tinocordiside	142-143
			Syringin	144-145
			Syringin-apiosylglycoside,	139-140
			Tinocordifolioside, cordioside, cordifolioside A, cordifolioside B, palmatoside C31, palmatoside F31, cordiofolioside B2, cordifolioside D2, cordifolioside	141,143-144, 146-148
Sesquiterpenoid	Tinocordifolin	150		
Root	Alkaloid	Palmatine	136,149	
Aerial parts	Steroids	b-sitosterol, d-sitosterol, g-sitosterol b-hydroxyecdysone, ecdysterone, makisterone, giloinsterol jateorine, columbin	151-152	
Whole plant	Diterpenoid lactones	Furanolactone, tinosporon , columbin	153-155	
	Aliphatic compound	Octacosanol, heptacosanol	156	
	Miscellaneous compound	Nonacosan-15-one 3, (a,4-dihydroxy-3-methoxy-benzyl)-4-(4-hydroxy-3-methoxy-benzyl)-tetrahydrofuran, Tinosponidine, 6 cordifol, 6 Cordifelone, 6 Jatrorrhizine	157-158	

#### VI. Uses:

- Anti-cancer
- Anti-inflammatory<sup>1</sup>
- Anti-ageing
- Immunity enhancer
- Digestion enhancer
- Anti-oxidant
- Anti-diabetic (reduces the blood sugar level)
- Anti-spasmodic (helps in relieving muscle spasms)
- Anti-arthritic (helps to mitigate the joint pains associated with arthritis)
- Liver-protective
- Anti-allergic (helps to fight allergic reactions)
- Anti-stress<sup>3</sup>

### VII.Mechanism action :

The identification of phytochemical actives in *T. cordifolia* extracts and fractions by dereplication experiments has provided significant understanding of the plant's immunomodulatory mechanism or mechanisms. The glycosides cordifoliosides A and B isolated from the stem of *T. cordifolia* were shown to have immune potentiating effect in early investigations; this was demonstrated by increased production of IgG antibodies in Balb/c mice that received subcutaneous injections of sheep red blood cells (M aurya et al. 1996). Increased antibody production was seen for cordifolioside A and additional *T. cordifolia* active principles, such as syringin, cordiol, and cordioside, using the same mouse paradigm (Kapi l and Sharma 1997). Additionally, Kapil et al. noted that peritoneal macrophage phagocytic activity was elevated by cordioside A, cordioside, and cordiol (Kapil and Sharma 1997). Other organizations have employed dereplication methodologies to discover the specific phytochemicals accountable for *T. cordifolia*'s immunomodulatory effect, following the aforementioned research. For instance, Sharma et al. separated *T. cordifolia* stem powder with water, nhexane, ethyl acetate, chloroform, nbutanol, and water after extracting the powder using either hot water or methanol (Sharma et al. 2012). *T. cordifolia* contains a variety of polysaccharides that have been shown to have immunomodulatory properties (Jahfar and Azadi 2004; Venkata Rao and Venkateswara Rao 1981; Nair et al. 2004; Chintalwar et al. 1999; Roja et al. 2005; Jahfar 2003). Chintalwar and colleagues (1999) initially detected the arabinogalactan polysaccharide G1-

4A in *T. cordifolia* stem water extracts and subsequently proved its polygenic mito-genic activity in Bcells. In a later investigation, lipopolysaccharide (LPS) induced mortality in a mouse model of septicemia was reduced by pretreatment with G1-4A (Desai et al. 2007). Raghu et al. employed anti-TLR4 (toll like receptor 4) antibodies to show that G1-4A functioned as a TLR4 agonist and stimulated murine Bcells, increasing lymphocyte proliferation and splenic cellularity, supporting this theory. (2009, Raghu et al.).

Also, *T. cordifolia* extracts have immunomodulatory activity apart from the low molecular weight phytochemicals and polysaccharides discussed previously. As an illustration, guduchi immunomodulatory protein (ImP), an immunostimulatory protein, was discovered to exist in *T. cordifolia* stem powder, both fresh and dry (Aranha et al. 2012). But in the leaf extracts of *T. cordifolia*, it was practically nonexistent. The guduchi ImP exhibited mitogenic action against thymocytes and splenocytes in mice. Additionally, guduchi ImP increased the phagocytic and bactericidal activities of murine macrophages without eliciting hemagglutination activity.

### VIII.Benefits of guduchi :



## IX. PHARMACOLOGICAL ASPECTS :

In ancient time, *T. cordifolia* has been recognized as the most widely used plant in traditional plant medicine due to its anti-diabetic, allergen-free and spasmolytic properties. The herb greatly strengthens immunity framework. This plant has a lot of beneficial qualities. Its stem is utilized as a diuretic and bitter stomachic, while its root is recognized for its antimalarial and stress-relieving qualities. It helps to treat jaundice, enrich the blood, and increase biliary secretion. The following are some of *T. cordifolia*'s principal biological activities.

### Immune Booster

Guduchi is strong immune-stimulant with excellent anti-cytotoxic effects. It is a holistic immunity boosting nutritional supplement from Vedic Herbals. If you start taking it 45 days in advance, before winter begins, it helps build natural immunity. Guduchi fights against fever and infections, boosts immunity and adds glow to skin. Guduchi, also known as Giloy, is referred to as "Amrit" in Sanskrit, meaning "divine nectar." Immunity is stronger when you have a good digestion, strong metabolism, proper liver functioning and a balanced endocrine system. A good immune system is like an 'antivirus' defense against illness. Immunity cannot be pumped into anyone, but it can be built by living an Ayurvedic lifestyle.

### Anti- Infective

The herb *T. cordifolia* is traditionally recognized for its jwarahara activity, or antipyretic activity.

Significant antipyretic activity has been demonstrated by the water soluble component of the plant's 95% ethanolic extract.[75] In an additional experimental investigation, the hexane- and chloroform soluble sections of *T. cordifolia* stems were found to have antipyretic properties.[76] Numerous studies demonstrate *T. cordifolia*'s exceptional anti-infective and antipyretic qualities.[77,78] Pretreatment with *T. cordifolia* was demonstrated to significantly lower mortality from *E. coli* induced peritonitis in mice and to confer protection against mortality caused by intraabdominal sepsis following coecal ligation in rats

### ANTI-TOXIN ACTIVITY

By modifying various hormone and mineral levels, guduchi exhibits a protective effect and may be able to scavenge free radicals. According to reports, *T. cordifolia* can restore the toxicity that aflatoxin causes in the kidneys of Swiss albino mice. It does this by significantly raising hormone levels (like glutathione) and enzyme activity (like catalase and glutathione reductase); it also lowers reactive oxygen species (ROS). And this plant's alkaloids are principally responsible for this anti-toxin action.<sup>58</sup> Lead nitrate toxicity in Swiss albino mice is manifested by a reduction in the blood serum's leucocyte and erythrocyte counts.

### ANTI-DIABETIC ACTIVITY

Alkaloids, cardiac glycosides, saponins, flavonoids, tannins, and steroids are among the substances that have been extracted from guduchi that have anti-diabetic properties.

As a result, it enables broad applicability in both experimental and clinical research.

Alkaloids from guduchi are said to have effects mediated by insulin and to have an impact similar to that of insulin hormone.<sup>26</sup> Increased GSH levels and other reactive species that could endanger both the mother and the fetus are possible side effects of gestational diabetes. Nonetheless, a study found that *T. cordifolia* had a protective effect by lowering the oxidative load and preventing the relative occurrence of illnesses and birth defects when administered as part of a daily meal to a diabetic pregnant rat (streptozocin induced diabetes).<sup>62</sup> Using a diabetic rat model, guduchi root extracts

highlight its anti-diabetic and cholesterol-reducing properties by attenuating the brain mediated lipid level and lowering blood and urine glucose levels.<sup>63</sup>

## ANTI-HIV ACTIVITY

It has been determined that *T. cordifolia* is useful in treating HIV-positive patients because it lessens the patients' resistance to the retroviral regimen.<sup>104</sup> *T. cordifolia*'s anti-HIV efficacy reveals its usefulness in controlling the illness by raising the number of CD4 T cells and lowering the number of eosinophils, a kind of white blood cells, in HIV-positive patients. Significantly increased phagocytic and intracellular bactericidal activity was demonstrated by *T. cordifolia* extract. Peritoneal macrophages were similarly activated by *T. cordifolia*. *T. cordifolia* also has an increased capacity for intracellular killing and phagocytosis. *T. cordifolia* greatly increases the activity of macrophages, polymorph nuclear leucocytes, and Blymphocytes.<sup>101, 105, and 106.</sup>

## ANTI-HYPERGLYCEMIC ACTIVITY

In Ayurveda, *T. cordifolia* is frequently used to treat diabetes mellitus.<sup>[53, 58, 63]</sup> Numerous studies show that *T. cordifolia* administration improves the following conditions: [89] a meliorates experimental diabetic neuropathy and gastropathy in rats; [90] lowers blood sugar in a lindeduced hyperglycemic rats and rabbits; [91] significantly lowers blood glucose and brain lipids; [92,93] increases glucose metabolism in rodents; [93] has an inhibitory effect on adrenaline-induced hyperglycemia by pyrrolidine derivative; [94,95] and significantly lowers blood sugar in both normal and alloxan diabetic rabbits.

## X.Pharmacological Action:

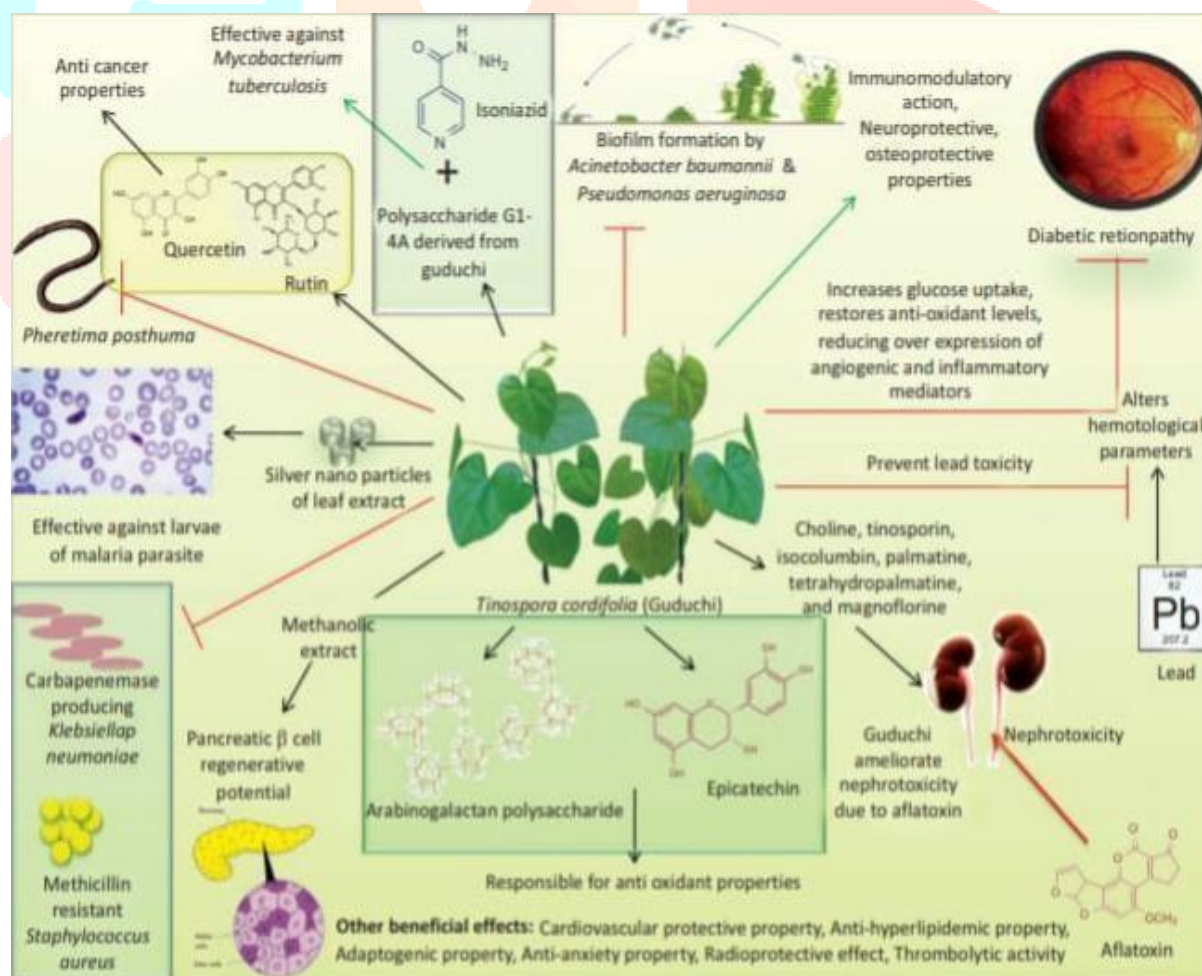


Figure 2:..An overview on medicinal and beneficial health applications of *T. cordifolia*.

## Side effects

So far, no study has reported the toxicological effects of *Tinospora cordifolia* or Guduchi, even in a very high dose (900 mg/D). But there is also limited information on the safety of using *Tinospora cordifolia* for longer periods or for pregnant and breast-feeding women. So, always consult with your doctor before using the herb.

## Table Shows the Therapeutic activity of *Tinospora cardifolia* :

Activity	Part/Extract	Animal Model/Cell Lines
Cardioprotective effect	Whole plant/ Alcohol extract	Calcium chloride administrated by intravenous infusion to produce arrhythmia in rats
Antiulcer activity	Whole plant/ Ethanol and Aqueous extracts	Albino rats using pylorus ligation induced ulcer.
Antidiarrheal activity	Whole plant/Ethanol and Aqueous extract	Castor oil and Magnesium sulphate induced diarrhea in albino rats.
Analgesic activity	Whole plant/Ethanol extract	Hot plate and abdominal writhing method in albino rats.
Aphrodisiac property	Aqueous and hydroalcoholic extract	Adult albino rats of wistar strain.
Immunomodulatory activity	Whole plant/Aqueous extract	Swiss male albino mice.
Antidyslipidemic activity	Stem Extract	Alloxan induced diabetic male adult rats of charles foster strain.
Neuroprotective effect	Aerial parts/ Ethanol extracts	6-hydroxy dopamine lesion rat models of Parkinson's disease.
Anti-inflammatory activity	Stem/Aqueous extract	Carrageenan induced paw edema model in rats.
Gastroprotective activity	Whole plant	Indomethacin induced gastric ulcer in rats.
Antioxidant activity	Whole plant/Ethanol extract	N-nitrosodiethylamine induced liver cancer in male wistar albino rats.
Radio protective and Cytoprotective activity	Stem/Ethanol extract	4 Gy- $\gamma$ radiation in albino mice and cyclophosphamide induced genotoxicity.
Antifeedant activity	Whole plant/ Chloroform Extract	Microorganism used: <i>Earias vitella</i> , <i>Plutella xylostella</i> , <i>Spodoptera litura</i> .
Ameliorative effect	Root/Ethanol extract	Male swiss albino mice exposed to aflatoxin B1.
Hepatoprotective activity	Whole plant/ Aqueous Extract	Bile duct ligation induced jaundice in rats.
Nootropic effect	Whole plant/Ethanol extract	Amnesic rats using radial arm maze task performance and barnes maze test.
Hypoglycemic activity	Stem/ Aqueous Extract	Insulin released effect was detected in vitro using rat pancreatic $\beta$ -cell lines.
Antipsychotic activity	Aqueous and Ethanol extract	Amphetamine challenged mice model.
Antidepressant activity	Petroleum ether extract	Swiss albino mice and activity was evaluated using tail suspension test and forced swim test.
Antiosteoporotic activity	Stem/Ethanol extract	Female sprague-dawley rats.
Antineoplastic activity	Aerial parts/DCM extract	Mice transplanted with ehrlich ascites carcinoma.
Antifertility effect	Stem/Methanol extract	Male rats.
Antiasthmatic activity	Stem/Hydroalcoholic Extract	Mice were sensitized with intraperitoneal ovalbumin followed by intranasal ovalbumin in vivo asthma model.
Antitumor activity	Aqueous alcoholic extract	C6 glioma cells were used, extract reduced the cell proliferation in dose dependant manner.
Allergic rhinitis	Aqueous extract	Double blind placebo-controlled trial.
Diabetic neuropathy	Stem/aqueous extract	Streptozotocin induced wistar albino diabetic rats and in vitro aldose reductase inhibition assay and in vivo results were analysed with Mann whitney Test.
Antimalarial activity	Stem/ Ethanolic extract	Microorganism used <i>Plasmodium berghei</i> on white swiss mice models.
Hepatocellular carcinoma	Aerial parts/ Ether extract	Diethyl nitrosamine induced hepatocellular carcinoma in male wistar rats.
Anticancer activity	Aqueous and Ethanolic extract	IMR 32 human neuroblastoma cell lines as a model system.
Antibacterial activity	Stem/ Aqueous and Ethanolic Extract	Microorganisms used: <i>E. coli</i> , <i>P. vulgaris</i> , <i>E. faecalis</i> , <i>S. typhi</i> , <i>S. aureus</i> , <i>S. marcescens</i> .

**XI. Conclusion:**

*Cordifolia* T. being a resourceful plant, it has a vast array of physiologically active substances that may have medicinal value. Reports from clinical and pharmacological investigations are available. They support this plant's ability to treat a variety of illnesses in a therapeutic and remedial manner. Numerous bioactive substances, such as steroids, glycosides, sesquiterpenoids, and alkaloids, have been shown to have potential uses, particularly as immunomodulators and antioxidants.

According to the many research done on *T. cordifolia*, it is a great medication that has not yet shown any harmful or hazardous consequences. In summary, this study provides information on *T. cordifolia*'s traditional antitoxin, antidiabetic, anticancer, immunomodulatory, antioxidant, and antibacterial properties. It can also be utilized to guide future research efforts aimed at developing new drugs.

**XII. ACKNOWLEDGEMENT:**

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