



Anti Microbial Activity Of *Tinospora Cardifolia*: A Review

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ABSTRACT

Tropical regions are home to the well-known medicinal herb guduchi (*Tinospora cordifolia*). All across the world, people are aware of its medicinal effects. The advantages of diet are less well known. Several Indian tribes include guduchi in their diets, and it is also present in classic Indian dishes. Ayurveda asserts additional nutritional advantages. The numerous advantages of using guduchia as a dietary element have been reviewed and explained in this article. The leaves, roots, and stems of Gilroy (*Tinospora cordifolia*), which are widely available in India, are said to have antibacterial, anti-inflammatory, and anti-tumor characteristics that make them effective in treating conditions like fever, jaundice, arthritis, diabetes, constipation, and hyperacidemia. *Tinospora cordifolia*, often known as giloy, has been used for many years as a medicine in India. Researchers have looked on the phytochemicals and antibacterial capabilities of giloy (*Tinospora cordifolia*).

KEYWORDS :*Tinospora cardifolia*, phytochemical, anti-microbial

INTRODUCTION

The Menispermaceae family includes *Tinospora cordifolia*, commonly known as "Giloy and Guduchi" in Sanskrit. It is renowned for treating a variety of diseases. It has a variety of medicinal properties, including anti-diabetic, anti-periodic, anti-spasmodic, anti-inflammatory, anti-arthritic, anti-oxidant, anti-allergic, anti-stress, anti-leprotic, anti-malarial, hepatoprotective, immunomodulatory, and anti-neoplastic activities. Its active ingredients include alkaloids, steroids, diterpenoids lactones, aliphatic.



Fig1 plant of *Tinospora cordifolia*.

1. It is a substantial, deciduous, widely spreading climbing shrub. It has simple, heart-shaped leaves that alternate with long, green petioles that can reach a length of 15 cm.
2. It has flowers that are unisex, bisexual, and heterosexual.
3. This herb's wood is soft, white, and porous, and the bark is either creamy white or grey in colour.
4. This herb flowers in the month of June and bears fruit in the month of November.
5. It is immunostimulating, antibacterial, anti-inflammatory, and anti-cancer.

BOTANICAL DESCRIPTION



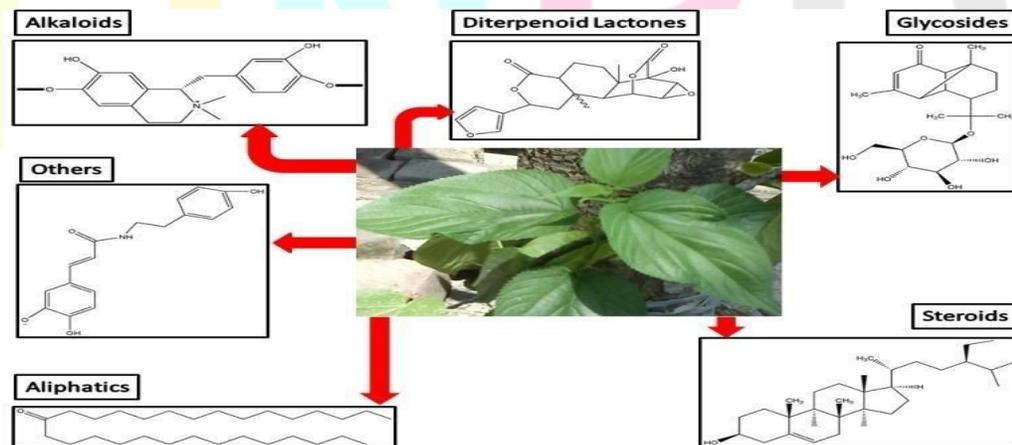
Fig2 *Tinospora cordifolia* leaves

Tinospora cordifolia is a huge, broadly spreading, rough, dioecious, evergreen climber that grows on a variety of trees and walls. It is said to produce separate male and female flowers. While young, the stem has a thin layer of brown bark covering a green succulent core and is covered in warty lenticels. The stem contracts as it dries out, and the bark separates from the wood. Lower branches are thin, drooping, with fleshy roots that are rubbed, striated, tuberous, pale, and occasionally glossy.

DISTRIBUTION

India, Myanmar, Sri Lanka, China, Thailand, Philippines, Indonesia, Malaysia, Borneo, Vietnam, Bangladesh, North Africa, West Africa, and South Africa are among the countries where it is native.

THE ACTIVE INGREDIENTS OF TINOSPORA CORDIFOLIA



Alkaloids, Terpenoids, Lignans, Steroids, and other chemical compounds have been documented to be present in the plant, establishing the phytochemistry and pharmacological action of *Tinospora cordifolia*.

CHEMICAL INGREDIENTS AND THEIR REPORTED BIOLOGICAL EFFECTS

ACTIVE COMPONENT	REPORTED BIOLOGICAL EFFECTS
Alkaloids	roles in anti-viral infection, anti-cancer, anti-inflammation, and immunomodulation.
Glycosides	treats neurological conditions such ALS, Parkinson's, dementia, deficiencies in motor and cognitive function, and spine neuron loss
Diterpenoid lactones	Vasorelaxant: relaxes constriction brought on by norepinephrine. limits the influx of Ca ⁺⁺ . anti-viral, anti-microbial, antihypertensive, and anti-inflammatory.
Steroids	Early inflammatory arthritis with glucocorticoid-induced osteoporosis and IgA neuropathy.
Aliphatic components	anti-inflammatory and analgesic ⁷

THERAPEUTIC EFFECTS**Antidiabetic Characteristics**

In India's traditional folk medicine, the stem extract of *Tinospora Cordifolia* is widely used to treat diabetes by controlling blood sugar levels. It is thought to exert its anti-diabetic effects by reducing oxidative stress (Zilches), encouraging insulin storage, and blocking the processes of gluconeogenesis and glycogenolysis, which control blood sugar. As the primary phytoconstituents of *Tinospora cordifolia*, alkaloids, tannins, cardiac glycosides, flavonoids, saponins, and steroids have been found to have anti-diabetic properties^{8,9}

Antitoxic Results

Similar alkaloids including choline, tinosporin, isocolumbin, palmatine, tetrahydropalmatine, and magnoflorine are found in *Tinospora cordifolia*, and they protect against aflatoxin-induced nephrotoxicity. *Tinospora cordifolia* extract taken orally exhibits activity against nephrotoxicity caused by aflatoxin. Lead's toxic effects are countered by the aqueous extract of *Tinospora cordifolia*'s stem and leaves, reducing the development of lead nitrate-induced liver damage^{10,11}

Effects That Fight Osteoporosis And Arthritis

Tinospora cordifolia and *Zingiber officinale* have been used in a remedy for rheumatoid arthritis. According to in vitro osteoblast model systems, *Tinospora cordifolia* has been shown to impact the growth, isolation, and mineralization of bone-like matrix, suggesting potential use as an antiosteoporotic medication. *Tinospora cordifolia* alcohol extracts have been demonstrated to encourage development^{12,13}

Effects Of Anti-HIV

Tinospora cordifolia extract had an impact on HIV because it decreased the number of eosinophils, stimulated B lymphocytes, macrophages, and polymorphonuclear leucocytes, and increased the percentage of haemoglobin, all of which indicate that it has potential benefits for treating this condition^{14,15}.

Anti-Microbiological Action

According to reports, *Tinospora cordifolia* methanol extracts may be effective against microbiological diseases. *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Proteus vulgaris*, *Shigella flexneri*, *Salmonella paratyphi*, *Salmonella typhimurium*, *Pseudomonas aeruginosa*, *Enterobacter aerogene*, and *Serratia marcescens* have all been tested for the anti-bacterial activity of *Tinospora cordifolia* extracts (Gram-positive bacteria)^{16,17}

Antioxidant Function

The erythrocytes' membrane lipid peroxide and catalase activity were both boosted by the anti-oxidant properties of *Tinospora cordifolia* stem methanol extracts when taken orally. In alloxan-induced diabetic rats, it also reduced SOD and GPx activity. Extracts of *Tinospora cordifolia* Willd. (Menispermaceae) may include antioxidants and aldose reductase inhibitors, which would lessen the chemotoxicity brought on by free radicals^{18,19}

The Ability To Fight Cancer

Animals have been the primary target of its claimed effects. By raising body weight, tissue weight, average body mass index, and tubular diameter as well as reducing the toxic effects of lethal gamma rays on the testicles in male Swiss Albino mice, *T. cordifolia* stem/Aqueous and ethanolic extract plays a role in radioprotective protection. Dihydrotestosterone, a component of *T.cordifolia* extract, encourages the development and division of human LNCap cells²⁰.

Anti-Depressant And Anti-Inflammatory Effects

As compared to the standard medication Diazepam at a dose of 2.5 mg/kg, it is claimed that the ethanolic extraction of *T. cordifolia* at a dose of 100 mg/kg produces considerable antidepressant activity at all levels. *T. cordifolia* stem or aqueous extract is useful for inflammatory issues in animals. Anti-stress ether activity is effective²¹.

Effect Of Hypolipidemia

The hypolipidemic impact of aqueous root extract in mice 2.5–5 g/kg body weight for 6 weeks results in decreased blood, phospholipids, fatty acids, and cholesterol in sugar alloxan mice, according to research. At 5 g/kg body weight, the root extraction dose shows a very high hypolipidemic impact. Heart disease risk increases when serum lipid levels fall²².

Wound Recovery

Recent studies compared the effectiveness of its alcoholic extract in treating dehydration in dexamethasone wounds. The T-strength output was raised by cutting and the dead area of the wound models that were used to evaluate the plant's ability to promote wound healing. *T. cordifolia* did not restore the dexamethasone-suppressed wound healing, suggesting that it may be attributed to promoting collagen formation²³.

COVID-19

It is claimed that *T. cordifolia* extract can be used to suppress COVID-19 infection. Gurjo's significance in the medical community has been underscored by the recent COVID-19 epidemic. Taking *T. cordifolia* along with ginger, tulsi, pepper, and turmeric will aid in boosting the body's immune system and preventing corona infection, claims Ayurved and Yog Guru Baba Ramdev. *T. Cordifolia* may be crucial in limiting viral adherence to host cells and the recurrence of acute acute respiratory syndrome coronavirus-2, according to certain other investigations²⁴.

ANTIMICROBIAL PROPERTIES OF VARIOUS T. CARDIFOLIA PARTS

Tinospora cordifolia extracts in methanol and ethanol have been investigated for their ability to inhibit the growth of a number of bacterial and fungus strains. The outcomes demonstrated that various extracts of had various inhibitory effects against various microbial strains. To investigate the antibacterial activity of the Tinospora plant against diverse microorganisms, crushed samples of stems and roots were employed. Methanolic extract of root and stem was ineffective against T. Codyfolia because we used root and stem samples for bacterial and fungus strains. A straightforward diffusion procedure was used to screen for antibacterial activity. Methanol has a bigger blocking area than other solvents, according to earlier research. Methanol produces a value of 9 mm, while other solvents produce values of 0, 0, and 0.25mm. respectively, against E. coli. The same behaviour was seen in the case of various bacteria and fungi, where methanol had more antibacterial action than ethanol and other solvents. The ethanolic extract exhibits a smaller inhibitory zone than the methanolic stem and root extract in this instance. Amphotericin is used to treat fungi, while ciprofloxacin is used to treat bacteria. As comparison to the ethanol extract, the methanol extract had a greater inhibitory zone. Methanol extract has stronger antibacterial and antifungal properties. The activity of the various extracts against the bacterial and fungal strains varied, but the ethanolic root extract displayed the least amount of inhibitory zonesconcluded that whereas root ethanolic extract has strong antibacterial action, it has poor antifungal activity. The aforementioned graphs make it evident that the methanoloic extract of roots and stems had the strongest inhibitory effect on bacterial and fungal strains²⁵.

REVIEW OF LITERATURE

- 1. Niraj S.Ghatpande, et al.; (2017)** reported using Tinospora Cordifolia as a treatment for skin conditions including eczema. Water, methanol, chloroform, and petroleum ether were used for hot extractions of the whole plant's powdered medicine. Cold extraction was also carried out in the case of water. After drying, all of the extracts were tested for phytochemical composition, antioxidant capacity, and antimicrobial capability²⁶.
- 2. C. Bharathi, et al.; (2018)** According to reports, this plant's root, stem, and leaf are mostly responsible for its pharmacological significance. It contains a range of phytoactive substances, including lactones, alkaloids, steroids, glycosides, and polysaccharides. Immunomodulatory capabilities are present in almost all plant parts²⁷.
- 3. Harjeet Singh, et al.; (2019)** claimed that the World Health Organization has classified diabetes mellitus as an epidemic with a significant risk of contracting other diseases and dying. Glycemic management, which can be achieved with oral hypoglycemic medications, insulin therapy, dietary counselling, consistent physical activity, and psychosocial support, are the mainstays of the treatment for this pathology. Other adjuvant therapies are also used, such as phototherapy, with Tinospora cordifolia being one of the most popular plants. Tinospora cordifolia patents for the treatment of diabetes mellitus have been examined and addressed in the current review²⁸.
- 4. Annalisa Palmieri, et al.; (2019)** claimed that berberine (BBR) is a naturally occurring active ingredient that may have anticancer properties. The substance targets a variety of cell signalling pathways, including differentiation, proliferation, and the transition between epithelial and mesenchymal tissue. The objective of this work was to compare the effects of isolated BBR with those of the extract of Tinospora cordifolia, a medicinal plant that contains this metabolite 14, in order to clarify the mechanisms behind the anticancer action of BBR²⁹.
- 5. Kumar Narendra, et al.; (2019)** The primary dominating fungus, Fusarium oxysporum and Aspergillus niger, were used in a reported in-depth examination of the Tinospora oil, and the MIC was recorded as 400 ppm. After autoclaving, there were no negative effects on the oil's antifungal effectiveness against the two

test fungi. Moreover, there was no negative impact on the oil's (400 ppm) fungus inhibitory action for a 120-day storage period³⁰.

- 6. Niraj S.Ghatpande, et al.; (2019)** reported that tests were done both in vitro and in vivo to see how TC affected AI. In order to identify the active components in the TC extract, HPLC experiments were also conducted. By administering HKBA to Wistar rats repeatedly, a model system displaying AI was created. As comparison to the inflammatory control group¹⁷, TC treated groups displayed significantly greater levels of Hb and RBC count³¹.

FORMULATION FOR MARKETING

- **Giloy Satava Powder:** Made from the maceration of *Tinospora cordifolia* plant's aqueous extract, Giloy Satava Powder is a strong ayurvedic preparation. This powder, also known as guduchi satva, is extremely beneficial for treating a wide range of health issues, including indigestion, constipation, burning hands and feet, fever, gout, lethargy, jaundice, diabetes, liver issues, and overall debility.
- **Giloy Ghana vati:** Also known as *Tinospora cordifolia* in botanical terms, Guduchi is an extract that is used in the powerful Ayurvedic preparation known as Giloy Ghana vati. Due to its significant significance in treating a variety of health issues like fever, gout, weariness, jaundice, indigestion, and general weakness, the Ayurveda extensively refers to Giloy in its numerous Ayurvedic preparations.
- **Giloy Ghanvati:** 60 N 40 g Patanjali Giloy Ghanvati It is used to address issues with the immune system and general fever. useful for conditions like debility, fever, skin, and urinary diseases. Moreover, it helps with general weakness, fever, dengue, and chickenGuinea.
- **Giloy ghanvati tablets:** By lowering Ama, Giloy helps to relieve pain and swelling throughout the body³².

ADVANTAGES

- Giloy, an Ayurveda medication well-known for its AntiOxidant and Detoxifying effects, is a powerful immune system booster.
- Giloy extract aids in blood detoxification to strengthen the immune system.
- **ELIMINATION OF JOINT PAIN:** Due to its potent anti-inflammatory qualities, giloy extract is useful for reducing joint pain as well as for heart and brain health.
- **HIGHEST BIO-AVAILABILITY:** Bio Piperine has been added to the formula to increase bioavailability and absorption in the body, assuring optimum efficacy.
- Giloy's also shows effects on blood pressure, inflammation, antioxidants, hepatoprotection, and pruritis^{33,34}.

CONCLUSION

All types of life can benefit from a plant like *Tinospora cordifolia*, which serves a variety functions. According to reports, glycosides, lactones, and steroids are among the active components found in plant extracts, as was before argued. All of these active ingredients have various physiological and immune-modulatory functions, highlighting the plant's flexibility. Research must be done to understand how active composites alter the links between structure and function in biological systems. *Tinospora*'s factory serves as a terrific resource for the scientific community in the field of drugs because it has so much to give.

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