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PHARMACOLOGICAL ACTIVITIES OF TINOSPORA CORDIFOLIA (GILOY): A COMPREHENSIVE REVIEW

Nakul Agarawal[1], Abhishek Nagar[2], M. K. Gupta[3]

[1]PG Scholar, Career Point School of Pharmacy, Career Point University, Kota, India
[2]Associate Professor, Career Point School of Pharmacy, Career Point University, Kota, India
[3]Professor, Career Point School of Pharmacy, Career Point University, Kota, India
Corresponding author: nakulag10@gmail.com

Abstract

Tinospora cordifolia (Willd.) Miers, popularly known as Giloy or Guduchi, is a vital medicinal plant in Indian traditional medicine with diverse pharmacological applications. Classified as a "Rasayana" in Ayurveda, it has been used for centuries to enhance immunity, vitality, and overall health. This review presents a comprehensive overview of the pharmacological activities, phytochemical profile, and modern medical relevance of *T. cordifolia*. The plant contains several bioactive constituents such as alkaloids (berberine, magnoflorine), glycosides (cordifolioside A), diterpenoids (tinosporide, columbin), phytosterols (β-sitosterol), and polysaccharides (glucans, arabinogalactans), contributing to its immunomodulatory, antioxidant, anti-inflammatory, hepatoprotective, antidiabetic, antimicrobial, and anticancer effects. It has shown significant therapeutic benefits in preclinical and limited clinical studies, especially in chronic diseases and post-viral conditions like COVID-19. However, despite promising outcomes, there are notable gaps in clinical validation, including standardized dosing, long-term safety evaluation, and herb-drug interaction profiling. This review emphasizes the need for large-scale, well-structured clinical studies to substantiate its medicinal potential and promote its inclusion in integrative medicine. *T. cordifolia* holds promise as a powerful natural agent for future therapeutic applications, provided its efficacy and safety are scientifically confirmed.

Keywords: *Tinospora cordifolia*, Giloy, phytoconstituents, pharmacological activities, clinical validation

1. INTRODUCTION:

Tinospora cordifolia (Willd.) Miers, commonly known as Giloy or Guduchi, is a highly valued medicinal plant belonging to the family Menispermaceae. It has long been revered in Indian traditional systems of medicine such as Ayurveda, Siddha, and Unani for its wide spectrum of therapeutic applications [1]. Classified as a "Rasayana"

in Ayurveda, *T. cordifolia* is known to promote longevity, enhance vitality, and act as an adaptogen by improving the body's resistance to stress and infections. Native to tropical and subtropical regions of India, the plant grows as a climbing shrub and is extensively distributed across the Indian subcontinent. The stems, roots, and leaves of *T. cordifolia* have been used in ethnomedicine for centuries [2]. Recent pharmacological studies have confirmed its diverse biological activities, including antioxidant, anti-inflammatory, immunomodulatory, hepatoprotective, antipyretic, anti-diabetic, and anti-cancer effects [3,4]. During the COVID-19 pandemic, the use of Giloy gained popularity due to its immune-boosting capabilities, drawing the attention of researchers globally. The therapeutic potential of this herb is attributed to its rich composition of bioactive phytoconstituents such as alkaloids, glycosides, terpenoids, and polysaccharides, which act on various physiological pathways and immune mechanisms [5].

Figure 1: ***Tinospora cordifolia (from google)***

2. OBJECTIVES OF THE REVIEW:

The primary aim of this review is to provide a comprehensive and critical analysis of the diverse pharmacological activities exhibited by *Tinospora cordifolia* (Giloy). By exploring its bioactive phytoconstituents and their mechanisms of action, this review also highlights its potential applications in modern therapeutic practices.

- To compile and critically analyze various pharmacological activities of *Tinospora cordifolia*.
- To explore the phytoconstituents responsible for its therapeutic effects.
- To summarize its potential applications in modern medicine.
- To identify future research gaps for clinical validation.

3. PHARMACOLOGICAL ACTIVITIES OF TINOSPORA CORDIFOLIA:

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Tinospora cordifolia exhibits a wide range of pharmacological activities supported by numerous in vitro, in vivo, and clinical studies. Its therapeutic effects are largely attributed to bioactive phytochemicals such as alkaloids, glycosides, diterpenoids, steroids, and polysaccharides [6]. It shows significant immunomodulatory effects by enhancing macrophage function and cytokine release. Antioxidant and anti-inflammatory actions are mediated through free radical scavenging and inhibition of COX/LOX enzymes. It also improves glycemic control in diabetic models, protects against liver damage, reduces fever, and exhibits anticancer, antimicrobial, neuroprotective, and anti-HIV properties through various cellular pathways [7-11].

Table 1: Pharmacological Activities of Tinospora cordifolia

S. No.	Pharmacological Activity	Study Type	Mechanism
1	Immunomodulatory [1]	In vivo, Clinical	Enhances macrophage activity, cytokine production (TNF-α, IL-6)
2	Antioxidant [5]	In vitro, In vivo	Scavenges free radicals; increases SOD and catalase
3	Anti-inflammatory [6]	In vivo	Inhibits COX and LOX pathways
4	Antidiabetic [7]	In vivo, Clinical	Modulates insulin secretion, improves glucose tolerance
5	Hepatoprotective [8]	In vivo	Prevents CCl4 and paracetamol-induced hepatotoxicity
6	Antipyretic [9]	In vivo	Reduces yeast-induced fever
7	Anti-cancer [8,10,11]	In vitro	Induces apoptosis, inhibits cell proliferation
8	Antimicrobial [12]	In vitro	Effective against gram-positive and gram-negative bacteria
9	Neuroprotective [11]	In vivo	Enhances memory, protects neurons against oxidative stress
10	Anti-HIV [813]	In vitro	Inhibits reverse transcriptase enzyme

4. PHYTOCONSTITUENTS RESPONSIBLE FOR PHARMACOLOGICAL ACTIVITIES:

Tinospora cordifolia is pharmacologically active due to a diverse range of phytoconstituents. Alkaloids like berberine and magnoflorine exhibit antimicrobial, antioxidant, and

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neuroprotective effects. Diterpenoid lactones such as tinosporide and columbin are responsible for anti-inflammatory, antipyretic, and anticancer activities [2,10]. Glycosides like cordifolioside A contribute to immunomodulation and hepatoprotection, while β-sitosterol, a phytosterol, displays anti-inflammatory and antioxidant potential. Additionally, arabinogalactans and glucans—its polysaccharide components—are known for enhancing immune responses. These constituents act through diverse mechanisms including cytokine modulation, enzyme inhibition, and free radical scavenging, making *T. cordifolia* a potent therapeutic candidate in traditional and modern medicine [2,10].

Table 2: Major Phytoconstituents and Their Pharmacological Roles

S. No.	Phytoconstituent	Chemical Class	Associated Activity
1	Tinosporide	Diterpenoid lactone	Anti-inflammatory, anti-cancer [10]
2	Cordifolioside A	Glycoside	Immunomodulatory, hepatoprotective [2]
3	Magnoflorine	Alkaloid	Antioxidant, neuroprotective [3]
4	Berberine	Alkaloid	Antimicrobial, anti-diabetic [1]
5	β-sitosterol	Phytosterol	Anti-inflammatory, antioxidant [5]
6	Polysaccharides	Glucans, arabinogalactans	Immunostimulant [10]
7	Columbin	Diterpenoid	Antioxidant, antipyretic [3]

5. POTENTIAL APPLICATIONS OF *TINOSPORA CORDIFOLIA* IN MODERN MEDICINE:

- **Immunomodulator** – Enhances immunity in autoimmune and post-viral conditions.
- **Antioxidant** – Protects against oxidative stress and aging [1].
- **Antidiabetic** – Regulates blood glucose and improves insulin action [2].
- **Hepatoprotective** – Prevents liver damage in hepatitis and toxicity.
- **Anti-inflammatory** – Useful in arthritis and chronic inflammation [3].
- **Antimicrobial** – Effective against various bacterial infections.
- **Neuroprotective** – Improves memory; potential in neurodegenerative diseases [5].
- **Anti-cancer** – Induces cancer cell apoptosis; supports chemotherapy.
- **Antipyretic & Adaptogen** – Reduces fever; boosts stress resistance.
- **Viral Supportive Therapy** – Boosts recovery in viral illnesses like COVID-19 [10].

6. IDENTIFYING FUTURE RESEARCH GAPS FOR CLINICAL VALIDATION OF *TINOSPORA CORDIFOLIA*:

Despite extensive preclinical studies highlighting the therapeutic potential of *Tinospora cordifolia*, there remains a significant gap in well-designed, large-scale human clinical trials. Most pharmacological claims rely on in vitro or animal studies, with limited data on dosage standardization, pharmacokinetics, and long-term safety in humans. Additionally, variations in extract preparation and lack of consistency in phytochemical profiling pose challenges in clinical reproducibility. Future research must focus on rigorous clinical validation, formulation standardization, and evaluation of herb-drug interactions to establish Giloy's efficacy and safety for integration into evidence-based modern medicine.

7. CONCLUSION:

Tinospora cordifolia exhibits a wide range of pharmacological activities supported by both traditional claims and modern research. Its active constituents show promising therapeutic potential for treating inflammatory, infectious, metabolic, hepatic, and immune disorders. However, more clinical trials and toxicological studies are required to confirm its safety and efficacy for widespread medical use. This review underscores the importance of integrating *T. cordifolia* into evidence-based herbal pharmacotherapy.

8. REFERENCES:

1. Saha S, Ghosh S. Tinospora cordifolia: One plant, many roles. *Ancient Sci Life*. 2012;31(4):151-159.
2. Sharma U, Bala M, Kumar N, et al. Immunomodulatory active compounds from Tinospora cordifolia. *J Ethnopharmacol*. 2012;141(3):918-926.
3. Upadhyay AK, Kumar K, Kumar A, Mishra HS. Tinospora cordifolia (Willd.) Hook. f. and Thomson–a plant with immense economic potential. *Indian J Tradit Know*. 2010;9(3):577-590.
4. Kalikar MV, Thawani VR, Varadpande UK, et al. Immunomodulatory effect of Tinospora cordifolia extract in HIV positive patients. *Indian J Pharmacol*. 2008;40(3):107-110.
5. Sharma P, Dwivedee BP, Bisht D, Dash AK, Kumar D. The chemical constituents and diverse pharmacological importance of Tinospora cordifolia. *Heliyon*. 2019;5(9):e02437.
6. Kumar V, Chopra AK, Kaushik S, et al. Antioxidant and free radical scavenging potential of *Tinospora cordifolia*. *Indian J Pharm Sci*. 2011;73(6):676–682.

7. Singh SS, Pandey SC, Srivastava S, et al. Chemistry and medicinal properties of *Tinospora cordifolia*. *Indian J Pharmacol*. 2003;35(2):83–91.
8. Stanely Mainzen Prince P, Menon VP, Gunasekaran G. Hypoglycaemic activity of *Tinospora cordifolia* in alloxan-induced diabetic rats. *J Ethnopharmacol*. 1999;70(1):9–15.
9. Rege NN, Thatte UM, Dahanukar SA. Adaptogenic properties of six rasayana herbs used in Ayurvedic medicine. *Phytother Res*. 1999;13(4):275–291.
10. Nair PKR, Melnick SJ, Ramachandran R, et al. Mechanism of action of *Tinospora cordifolia* extract in cancer cells. *Evid Based Complement Alternat Med*. 2004;1(3):375–386.
11. Thatte UM, Dahanukar SA. Immunotherapeutic modification of experimental infections by Indian medicinal plants. *Phytother Res*. 1997;11(1):32–37.
12. Kalikar MV, Thawani VR, Varadpande UK, et al. Immunomodulatory effect of *Tinospora cordifolia* extract in HIV positive patients. *Indian J Pharmacol*. 2008;40(3):107–110.