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Review Article

A Comprehensive Review on *Tinospora cordifolia* Nutritional Profile, Phytochemistry, Pharmacology and Therapeutic Potential

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ABSTRACT

Medicinal herbs have been used since ancient times. Since synthetic drugs are expensive and have multiple side effects, the use of traditional medicine is the cheapest and most accessible way of treatment. The medicinal plant *Tinospora cordifolia* belongs to the *Menispermaceae* family. Immunomodulation, antipyretic action, antioxidant activity, anti-inflammatory action, liver protection, antidiabetic action, and antitumor activity are just a few of the many medicinal properties known about this plant. As a result of the presence of a high number of phytochemicals such as alkaloids, diterpenoid lactones, glycosides, steroids, and polysaccharides, *T. cordifolia* is an important constituent of modern herbal medicine. This review offers a comprehensive discussion of the phytochemistry, pharmacological properties, and ethnobotany of this medicinal plant. The literature was screened using predefined inclusion and exclusion criteria, and the extracted data were compiled in tabulated and figure form. Due to its adaptogenic properties and modification of the immune system, the plant has shown tremendous potential in being considered for medical research work, particularly in the treatment of infectious and chronic diseases. Its pharmacological properties have exhibited significant potential in increasing the usefulness of biopharmaceuticals in treating various diseases and industrial applications. This review brings out some important information concerning the nutritional information, phytochemicals, bioactive compounds, and pharmacological properties of *Tinospora cordifolia* for therapeutic uses. The researchers, physicians, pharmaceutical firms, and food industry can benefit a lot from the information since it will help them develop valuable drugs and food items.

INTRODUCTION

Plants and trees have been extremely essential to humans from the beginning up to today. In primitive ages, man used them both for his spiritual purposes, like magic and rituals, and also for his physical purposes such as food, clothing, accommodation, medicines, implements, and decorations. There are several benefits of using local and traditional medicine when they have been scientifically proven to be harmless, safe, economical, and culturally acceptable. Being usually easily available locally, medicinal herbs are quite economical. In the traditional medicine systems like Ayurveda, Siddha, and Unani, *Tinospora cordifolia*, which is commonly known as *T. cordifolia* or Guduchi, is one of the well-known medicinal herbs. It is a big deciduous climber that grows on rocks and trees in tropical and subtropical regions of Pakistan and Southeast Asia. This plant is considered very important due to its health benefits and belongs to the *Menispermaceae* family. This plant has great potential in the pharmaceutical industry

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and agro-food sector [1]. The stem has succulent branches with strong filiform and fleshy aerial roots. The leaves are alternately arranged, heart-shaped, and membranous. The compound fruit consists of drupelets that are present on the stalk, have scars at the sub-terminal position, and are juicy and purple (Figure 1).



Figure 1: *Tinospora cordifolia* fruits, Leaves, stem, and Dried shoots [1]

The scientific evidence for its hepatoprotective, anti-inflammatory, antidiabetic, immunomodulatory, and antioxidative properties supports many of the applications for which it is traditionally used. The four most active phytochemicals responsible for the above properties are magnoflorine, cordifolioside A, berberine, and tinosporin. In addition, the use of this herb in herbal preparations to cure diabetes, UTI, chronic fever, and debility emphasizes the importance of this herb as both a preventive and therapeutic agent for health [2]. Photograph taken by the authors at the Food and Biotechnology Research Centre, PCSIR Labs Complex, Lahore, showing fresh fruits, leaves, stem, and dried shoots of the plant used as source material for this review.

Even though *Tinospora cordifolia* has been used extensively in traditional medicine, there is a critical lack of well-designed, standardized clinical studies in humans, and comprehensive pharmacokinetic, toxicological, and herb-drug interaction data to support all of the diverse pharmacological applications, including immunomodulatory, hepatoprotective, anti-diabetic, anti-inflammatory, anti-cancer, neuroprotective, and antimicrobial properties. *Tinospora cordifolia* (Guduchi), a widely used medicinal plant in traditional systems of medicine including Ayurveda, Siddha, and Unani, has been reported to possess therapeutic value in a wide range of diseases. The lack of good clinical validation, standard extraction and quality-control protocols, and full safety profiling, however, poses an important obstacle to its widespread use in therapy. This review aims to bring out some important information concerning the nutritional information, phytochemicals, bioactive compounds, and pharmacological properties of *Tinospora cordifolia* for therapeutic uses.

Literature material was taken from Web of Science, Scopus, PubMed, springer and analyzed using exclusion criteria. The literature search was performed using the following search strings and their combinations with Boolean operators: ("*Tinospora cordifolia*" OR "Guduchi") AND ("phytochemistry" OR "bioactive compounds" OR "nutritional composition" OR "pharmacological activity" OR "therapeutic potential" OR "immunomodulatory" OR "antidiabetic" OR "hepatoprotective" OR "anticancer" OR "toxicology"). The data were then presented in tabular and figure form. Between April and May of 2026, this study was conducted at the Food and Biotechnology Research Centre, PCSIR, Labs Complex, Lahore.

Nutritional Composition of *Tinospora cordifolia*

Tinospora cordifolia is widely known not only for the medicinal values it possesses but also for its high nutritional content. Various nutrients that are found in abundance in the plant include protein, carbohydrates, fiber, and various micronutrients such as calcium, phosphorus, and iron. The stem of the plant contains starch in abundance, which has been used in various herbal medicines. Also, various trace elements such as copper, manganese, and zinc add to its nutraceutical value [3]. It has been discovered that in the dried form of *T. cordifolia* there is a high presence of calcium, protein, iron, crude fiber, and ash (210 mg, 5.23 g, 22.55 mg, 52.295 g, and 5.88 percent, respectively). Moreover, it was discovered that in the dried form of *T. cordifolia,* there is a high presence of polyphenols (12.2 mg), flavonoids (18.28 mg), and anti-radical scavenging activity (19.75). Furthermore, its leaf extract has been found to contain high amounts of vitamin C, as well as other antioxidants that contribute to the effectiveness of the plant in terms of activating the immune system. In this way, the nutritional properties of *T. cordifolia* enhance its therapeutic value, making the plant highly suitable for the production of functional foods. Besides this, its high fiber content contributes to good digestion [4].

Bioactive Compounds of *Tinospora cordifolia*

The large list of phytochemicals found in *Tinospora cordifolia*, including a number of secondary metabolites, provides a broad array of potential uses for the plant in medicine. The main types of phytochemicals that have been isolated from this herb include alkaloids, diterpenoid lactones, steroids, flavonoids, lignans, saponins, and phenolics. For example, alkaloids like berberine and magnoflorine have known antimicrobial and anti-inflammatory properties. Diterpenoid lactones like tinosporide and cordifolide A have demonstrated their hepatoprotective and immunomodulating properties [5] (Table 1).

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Table 1: Bioactive Compounds of *Tinospora cordifolia* and Their Pharmacological Activities[6]

Class of Compound	Example	Reported Pharmacological Activities
Alkaloids	Berberine, Palmatine, Magnoflorine	Antimicrobial, anti-diabetic, anti-inflammatory
Diterpenoid Lactones	Tinosporide, Cordifolide, Cordifolia	Antipyretic, anti-cancer, hepatoprotective
Glycosides	Giloin, Giloinin	Antioxidant, hepatoprotective
Steroids	β-sitosterol, Ecdysteroids	Anti-inflammatory, adaptogenic
Flavonoids and Phenolics	Quercetin, Apigenin, Catechin	Antioxidant immune-enhancing
Polysaccharides	α-D-glucan (arabinogalactan-like)	Immunomodulatory, macrophage activation

Furthermore, the polysaccharides derived from the stem include arabinogalactan and glucans, which promote macrophage activation and immune response. Chemical profiling of the stem, leaves, and root parts of the plant has shown that the plant contains tannins, glycosides, and essential oils, demonstrating the wide range of chemical composition of the plant. Phenolics and flavonoids contribute to its strong antioxidant property, making it important for free radical scavenging[6].

Phytochemical Profile of *Tinospora cordifolia*

The advanced research suggests that these constituents function jointly to offer substantial medicinal benefits. The elaborate phytochemistry of the plant has been the reason for the employment of the plant in several medicinal formulations and in Ayurvedic medicine. It is also common knowledge that the *Tinospora cordifolia* plant is endowed with an elaborate phytochemical constitution that facilitates its wide-ranging pharmacological activities. Some of the phytoconstituents found in the stem, roots, and leaves of this plant include alkaloids, flavonoids, phenolics, terpenoids, lignans, glycosides, saponins, and steroids(Figure 2).

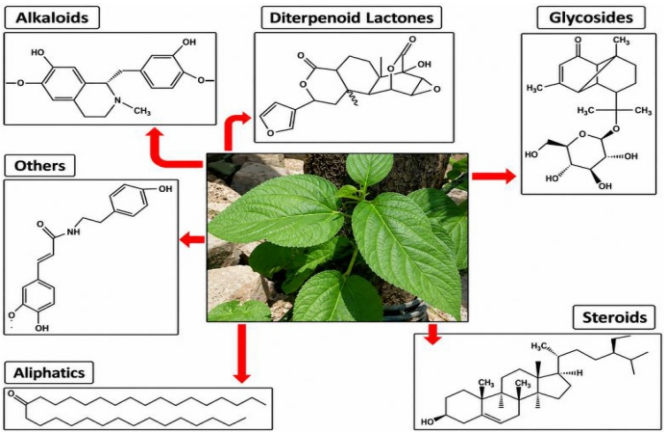


Figure 2: Phytochemical Constituents of *T. cordifolia*

These phytoconstituents that have been detected through the use of chromatography and spectroscopy are involved in most of the immune-modulating, liver-protecting, and antidiabetic properties of the plant. The phytochemicals include the alkaloid magnoflorine, the diterpenoid lactones tinosporide and columbin, among others. Also, cordifolioside A, syringin, and berberine enhance the plant's antibacterial and antioxidative properties. It has been established that tannins and essential oils are some of the phytoconstituents in *T. cordifolia*. Compound classes and their examples are not exhaustive; only representative constituents with documented pharmacological activity are listed. Data adapted and compiled from the cited source

General Anatomical and Microscopic Features of *Tinospora cordifolia*

Macroscopic and microscopic features of *Tinospora cordifolia* are essential in the identification and prevention of adulteration. The fresh stem is described as being cylindrical, having lenticels and protrusions that are more prominent in older stems based on scanning electron microscopy (SEM) and cryostat sections. Key features are elucidated through a morpho-anatomical comparison study between *T. cordifolia, T. sinensis,* and *T. crispa* using light microscopy; all species have a cork tissue characterized by radial rows of cells, although only *T. cordifolia* has relatively inconspicuous surface tubercles (compared to *T. crispa*). Its pith anatomy comprises wedge-shaped vascular bundles with numerous rays, which is a significant characteristic of real plants against fakes[7, 8]. The structures belonging to dorsiventral leaf anatomy include anisocytic stomata, palisade and spongy mesophyll, glandular trichomes, and both the upper and lower epidermis. Under a microscope, the pubescent leaves measuring 10–20 cm in length show the cordate shape and petiole. With SEM, several types of trichomes and crystals can be seen. These morphological and microscopic characteristics are important for the quality control of herbal plants to distinguish true *T. cordifolia* from adulterants[9].

Pharmacological Properties and Medicinal Significance of *Tinospora cordifolia*

The diverse pharmacological actions of *Tinospora cordifolia* have made it an extensively used drug in several medicinal traditions(Table 2).

Table 2: Therapeutic Utility and Disease-Specific Applications of *Tinospora cordifolia*

Application Area	Disease-Specific Applications
COVID-19	T cell differentiation and neutrophil functions
Immune System Support	Enhances both innate and adaptive immunity; used as an immunomodulator in viral infections
Antipyretic Activity	Antipyretic activity for its jwarahara action
Liver Protection	Prevents drug-induced hepatotoxicity and oxidative stress in liver tissues

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Cardio Protective	Benefits of β-sitosterol and stigmasterol in improving lipid profiles and reducing oxidative stress in cardiac tissues
Anti-Osteoporotic Effect	Isolated ecdysteroids, Beta-Ecdysone (Ecd) and 20-OH-β-Ecd against osteoporosis
Improve Skeletal Muscle Activity	Glucose transport promotion in skeletal muscle cells by PI-3-kinase and AMPK pathway
Antioxidant Activity	Tinosporaside, a bioactive substance produced, and flavonoids for removing oxidative stress and scavenging free radicals
Diabetes Management	Regulation of glucose in blood through enhanced insulin release and improved glucose uptake
Wound Healing Property	Dexamethasone could be attributed to improvement in collagen synthesis
Anti-Arthritic and Anti-Inflammatory Action	Reduces production of pro-inflammatory cytokines like TNF-α and IL-6
Neuroprotective	Inhibition of pro-inflammatory cytokines 1-methyl-4-phenyl-1, 2, 3, 6-tetra hydro pyridine (MPTP)-induced parkinsonism
Antimicrobial Effect	Active against E. coli, S. aureus, Candida albicans, and other pathogens
Cytotoxic and Anticancer Potential	Induces apoptosis in various cancer cell lines; studied for chemopreventive properties
Anti-anxiety/anti-HIV/Anti-cholesterol/ Allergic/viral	Used in Ayurveda as a Rasayana to enhance vitality, longevity, and resistance to stress

COVID-19 therapy (Against SARS-CoV-2)

Tinospora cordifolia is one of those integrative methods that can be used to improve immune function in response to COVID-19 infections. Patients treated with *T. cordifolia* and other medications reported less fatigue and increased energy [10]. Amritoside C, Amritoside B, Amritoside A, Tinocordifolin, Palmatoside G, Palmatoside F, and Maslinic acid are among the compounds found in *T. cordifolia* that have been found to be strong inhibitors of SARS-CoV-2 Spike protein binding to the human receptor protein ACE2. As a result, the six molecules are considered promising in the development of COVID-19 medications. The Berberine compound in *T. cordifolia* has been found to inhibit the protease enzyme 3CLpro responsible for replicating the SARS-CoV-2 virus using network pharmacology and molecular docking. The phytochemical compounds of *T. cordifolia* have been found to have a high affinity with the protease enzyme of SARS-CoV-2, and thus prevent viral replication of COVID-19 [11].

Immunomodulatory activity

This is due to the fact that it is composed of polysaccharides and di-terpenoids that enable the stimulation of macrophage activity and the actions of cytokines that have an important role in immuno-stimulation. This helps in increasing resistance to infections as well as improves the effectiveness of the immune system in human beings [12]. The plant is able to increase immunological activities through stimulation of macrophage activity and increasing white blood cells. It has been found that this enhances both innate and adaptive immunity through the stimulation of the actions of cytokines like TNF-α, IL-1, and IL-6 [13].

Antimicrobial Activity

The antimicrobial property of *T. cordifolia* is very well known. By blocking pathogenic cells, berberine and other alkaloids reduce the load of bacteria in infections such as typhoid fever, malaria, and viral infections. Efficacy against E. coli, *Staphylococcus aureus*, and other infections has been proven by in vitro studies. The aqueous, ethanolic, and acetone extracts of the leaves and stems of *Tinospora cordifolia* have been shown to possess maximum inhibitory action against clinical isolates of urinary pathogen bacteria such as *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. The silver nanoparticles of *Tinospora cordifolia* from the stems have been found to display excellent antibacterial properties against the multidrug-resistant strain of *Pseudomonas aeruginosa* isolated from burn patients [14].

Anticancer activity

Various studies with cancer models have demonstrated that the components of *T. cordifolia* can suppress angiogenesis, induce apoptosis, and inhibit tumor cell proliferation. Another benefit of this herb in the field of oncology is that it can help improve conventional treatment due to its radioprotective properties [15]. Selenium nanoparticle synthesis from the stem extract of *Tinospora cordifolia* using green technology and their anticancer applications were assessed in one study [16]. Researchers examined the anticancer potential of *T. cordifolia* extract in animal models using the response surface technique. The extract demonstrated anticancer efficacy in a mouse skin cancer model produced by 7, 12-dimethylbenz(a)anthracene(DMBA)[17].

Anti-Arthritic and Anti-inflammatory activity

Tinospora cordifolia has been utilized singly or in combination in traditional medicine for the treatment of rheumatoid arthritis. The medicinal plant known as *Tinospora cordifolia* may be used as an anti-osteoporosis drug owing to its capability of inhibiting the growth, differentiation, and mineralization of the bone matrix of osteoblast cells, which has already been proved. It has been shown that *Tinospora cordifolia* extract helps in osteoblast proliferation and bone mineralization. Moreover, the plant's active compounds inhibit the key enzymes and pathways responsible for the inflammatory processes, leading to a reduction in inflammation. There was also reduced joint swelling, paw edema, and pain intensification in animal models suffering from arthritis. The anti-inflammatory and anti-arthritic effects of *Tinospora cordifolia* have been studied in vivo and in vitro via the regulation of the JAK/STAT pathway. Arthritis and inflammation are complex diseases characterized by immunoregulatory abnormalities and inflammation [18].

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Antipyretic Activity

Furthermore, the property of fever reduction or jwarahara of *T. cordifolia* is already well known. Water-soluble fractions from 95% ethanolic extracts of *T. cordifolia* have been found to have antipyretic activities. Additionally, antipyretic activity of hexane- and chloroform-soluble fractions of the stem of *T. cordifolia* has also been reported. It has been shown that *T. cordifolia* has anti-infective and antipyretic properties [19].

Hepato-Suppression

Patients suffering from viral hepatitis had improved levels of bilirubin and normalization of liver enzymes (SGOT and SGPT) while using its formulations. The regenerative effect on hepatocytes, along with the antioxidant activity of flavonoids, was regarded as a crucial mechanism behind it. With the help of protein synthesis or bio-activation of CCl4 and drug-induced toxicity, *Tinospora cordifolia* plant extract defends itself against CCl4-induced hepatocellular damage by improving antioxidant defense and decreasing lipid peroxidation. Liver enzymes, including SGOT and SGPT, were normalized in patients suffering from liver disorders [20].

Cardioprotective Activity

Several research findings have shown that β-sitosterol and stigmasterol enhance the lipid profile and oxidative stress status of the heart. In ischemia-reperfusion injury model animals, treatment with *T. cordifolia* reduced the size of myocardial infarct and increased cardiac output [21].

Anti-Osteoporotic Effect

T. cordifolia has also been observed to stimulate osteoblastogenesis and, therefore, differentiation of cells into the osteoblast lineage and increase bone matrix mineralization. Application of *T. cordifolia* in osteoporosis management has been predicted due to its effect on the differentiation, proliferation, and mineralization of bone-like matrix in osteoblast cells. It has been noted that ecdysteroids present in the plant are anabolic to protein synthesis and block osteoporosis in animals. As β-ecdysone (Ecd) and 20-OH-β-Ecd have been observed to possess anti-osteoporotic properties, *T. cordifolia* can be used in osteoarthritis and osteoporosis treatment [22].

Improve Skeletal Muscle Activity

Glucose balance regulation is related to skeletal muscles, and problems with glucose transportation can lead to metabolic disorders such as diabetes. The use of *T. cordifolia* for enhancing glucose transportation in skeletal muscle via the PI-3-kinase and AMPK-dependent pathway was studied in one experiment [23].

Antioxidant Activity

Oxidative stress and liver dysfunction are connected with many diseases, and natural antioxidants play an important role in treatment. Tinosporaside, which is one of the bioactive ingredients of *Tinospora cordifolia*, showed good results in decreasing oxidative stress. Additionally, *T. cordifolia* extracts are useful in eliminating reactive oxygen species, improving the efficiency of antioxidant enzymes such as SOD and catalase, and inhibiting lipid peroxidation. Hence, these compounds have the ability to protect the cells from oxidative stress that normally arises due to diseases. In vivo studies on the hepatoprotective and antioxidant properties of *Tinospora cordifolia* root and leaf aqueous extract against lead poisoning have been done [24]. It was previously established that an aqueous extract of this plant acts as a scavenger due to the presence of antioxidants that defend against free radicals created in case of aflatoxicosis. The other alkaloids found in *T. cordifolia*, along with those that act as protectants for nephrotoxicity caused by aflatoxins, include choline, tinosporine, isocolumbin, palmetine, tetrahydropalmatine, and magnoflorine. Moreover, there is an increased level of ascorbic acid, protein, glutathione (GSH), and the activities of antioxidant enzymes like SOD, CAT, glutathione peroxidase, GST, and GR in the kidney when *T. cordifolia* is used. Here, it must be pointed out that there has been found protection for the liver of male albino mice against the toxic effects of lead nitrate has been found through the leaf and stem extract of *T. cordifolia.* In the same manner, there has been found protection for the liver against the toxic effects of lead nitrate has been found [25].

Antidiabetic Andanti-Obesity Potential

Diabetes mellitus, a metabolic disorder, is marked by high levels of glucose in the blood. Among those chemicals thought to be involved in the anti-diabetic properties of *T. cordifolia* stems are alkaloids, tannins, flavonoids, and saponins. The possible antidiabetic and anti-obesity effects of *Tinospora cordifolia* phytoconstituents were assessed through the application of in silico molecular docking. In silico docking studies of *Tinospora cordifolia* bioactive compounds with their protein targets associated with diabetes and obesity were carried out to determine the usefulness of the plant for treating diabetes. Molecular docking was used to predict the target protein and the bioactive components of *Tinospora cordifolia*. As a result, interactions between the target proteins and bioactive components have been determined [26].

Wound Healing Property

It was found that dexamethasone prevented the wound-healing property of the alcoholic extract of *T. cordifolia*. The high flexibility of the *T. cordifolia* extract, which may be due to the formation of collagen, was utilized to test the wound-healing properties of the plant extract. Dexamethasone-induced wound healing was not influenced by *T. cordifolia* extract [27].

Neuroprotective Use in Parkinson's Disease

Neuronal degeneration can be prevented by decreasing oxidative stress and neuroinflammation. It has been proven clinically that neurodegenerative diseases lead to impairment of learning and memory as well as mood regulation. Experimental animals with degenerative diseases like Alzheimer's disease have been found to

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demonstrate the neuroprotective effect of *T. cordifolia* due to its anti-inflammatory and antioxidant activities. According to Birla *et al.* aqueous extract of *T. cordifolia* has a potent sedating effect against parkinsonism. The aqueous extract on inflammation in the parkinsonian model of the animal treated with 1-methyl-4-phenyl-1, 2, 3, 6-tetrahydropyridine (MPTP) demonstrated the behavioral recovery of the MPTP-treated mice, therefore demonstrating the neuroprotective effect of *T. cordifolia* against neuroinflammation in MPTP parkinsonism [28].

Anti-Anxiety Action

The comparison between 100 mg/kg of the ethanolic extract of *T. cordifolia* and the standard dose of diazepam (2.5 mg/kg) showed that diazepam exhibited excellent anti-anxiety effects. It was observed from clinical studies that the intelligence quotient of the subjects was enhanced. The usage of T. cordifolia in Ayurveda for brain tonic and to enhance cognitive abilities like memory is common practice [29].

Anti-HIV Potential

Positive cases of HIV can be segregated through the root extract of *T. cordifolia*. It is possible that there exist excellent anti-HIV properties of *T. cordifolia* stem extract owing to its ability to reduce eosinophils, B lymphocytes, macrophages, hemoglobin, and polymorphonuclear leucocytes [30]. Furthermore, according to one study, *T. cordifolia* stem concentrate reduces eosinophil count, B lymphocyte proliferation, macrophage activation, hemoglobin level, and polymorphonuclear leucocytes [31] and may therefore have a significant anti-HIV potential. Additionally, the root concentrate of *T. cordifolia* promotes the safe management of HIV positive patients.

Hypolipidemic Effect

The hypolipidemic effect of an aqueous extract of the root was observed at doses of 2.5 g and 5.0 g/kg of body weight in the sixth week of testing on alloxan-induced diabetic rats. Tissue, serum, phospholipids, and free fatty acid levels were found to decrease due to this treatment. The root extract exhibited the highest hypolipedemic activity at a dose of 5.0 g/kg of body weight. No studies have been conducted in the past on the hypolipedemic activity of *T. cordifolia* root extract in diabetic rats [32].

Allergic rhinitis and Viral illnesses

People who were administered daily doses of *T. cordifolia* extract showed considerable reduction in nasal blockage, sneezing, and eye irritation in an 8-week double-blind, placebo-controlled trial. Higher platelet counts and faster recovery were observed in cases of taking *T. cordifolia* extract in the research conducted during the time of the dengue epidemic. Likewise, in hepatitis cases, taking *T. cordifolia* supplements led to improvement in liver functioning and reduced inflammation [33].

Toxicology and Safety

When used within therapeutic dosage ranges, *Tinospora cordifolia* is generally regarded as safe. On the other hand, excessive usage or ingestion of contaminated products has been connected to negative consequences. In a small percentage of patients, mild gastrointestinal problems such as constipation, nausea, and diarrhea have been documented. Sensitive people have been known to experience allergic reactions, such as skin rashes and itching. Despite being generally safe, its immunostimulatory activity may exacerbate underlying illnesses; therefore, care should be used when giving it to pregnant women, nursing mothers, and those with autoimmune disorders [34, 35].

Limitations and Future Recommendations

Despite its wide pharmacological promise, *Tinospora cordifolia* is limited by batch-to-batch variability in herbal preparations arising from differences in plant content, extraction methods, and dosing, as well as scarce human clinical trial data, since most existing evidence is derived from in vitro and animal studies with minimal information on toxicity and drug interactions. Future work should therefore focus on standardizing extraction and quality-control protocols, conducting well-designed randomized clinical trials, and undertaking comprehensive toxicological and pharmacokinetic profiling to validate its safety, efficacy, and dosage forms for mainstream therapeutic use.

CONCLUSIONS

Tinospora cordifolia has great promise as a medicinal plant due to its varied pharmacological activity and extensive phytochemical composition. It is a promising candidate for drug development and integrative medicine because of its many pharmacological characteristics, which include immunomodulation, hepatoprotection, hypolipidemic, anti-HIV, antidiabetic, neuroprotective, antimicrobial, anti-inflammatory, and anticancer actions. These properties are supported by recent research. To completely understand the mechanisms of action, determine its safety and effectiveness, and optimize dose forms, more research is necessary. Moreover, it is an excellent source of anti-toxins, which are commonly used by the body for its filtering process in removing dangerous substances produced by the body. This herb can also be one of the candidates for bio-prospecting and development of drugs that can treat various ailments. "*T. cordifolia* is likely to emerge as the leader in the traditional system of medicine" as a source for development of new drugs because of the substances it contains. Given its potential to benefit modern medicine, it is a valuable natural resource that merits more investigation and study.

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Authors' Contribution

Conceptualization: MKS
Methodology: MKS
Formal analysis: AAR, BR, AA
Writing and Drafting: MKS, NZ, SR
Review and Editing: MKS, NZ, SR, AAR, BR, AA

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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REFERENCES

[1] Verma S. Phytopharmacological Profile of Tinospora cordifolia: An Updated Review. Journal of Pharmacognosy and Phytochemistry. 2026 Jan.

[2] Siddiqui S, Jadaun S, Anusha R, Kumar N, Ashraf SA, Bishnoi JP. Medicinal Importance of Tinospora cordifolia (Willd.) Miers And Its Possible Use in the Food Industry for Value Addition. Discover Food. 2025 Oct; 5(1): 357. doi: 10.1007/s44187-025-00652-8.

[3] Singh R and Sharma L. Potential role of Tinospora cordifolia in Management of COVID-19: A Systematic Review. International Journal of Health Sciences. 2022; 6(S5): 10597-608. doi: 10.53730/ijhs.v6nS5.10812.

[4] Ahsan R, Mishra A, Badar B, Owais M, Mishra V. Therapeutic Application, Phytoactives and Pharmacology of Tinospora cordifolia: An Evocative Review. Chinese Journal of Integrative Medicine. 2023 Jun; 29(6): 549-55. doi: 10.1007/s11655-023-3733-2.

[5] Latif R and Nawaz T. Medicinal Plants and Human Health: A Comprehensive Review of Bioactive Compounds, Therapeutic Effects, and Applications. Phytochemistry Reviews. 2026 Mar; 25(3): 2299-342. doi: 10.1007/s11101-025-10194-7.

[6] Yamini and Rana A. Bioactive Compounds and Medicinal Properties of Tinospora cordifolia. Biotechnology Innovations for a Sustainable Future: Integrating Clean Energy, Life on the Planet, Clean Water, and Climate Action. 2026 Jan: 807-28. doi: 10.1007/978-981-97-9859-9_39.

[7] Shrestha J. Tinospora cordifolia (Willd.) Miers: Phytochemical Composition, Cytotoxicity, Proximate Analysis and Their Biological Activities. Cellular and Molecular Biology. 2021 Jan.

[8] Patil VS and Malpathak NP. Micro-Morphoanatomical Approach for Comparative Analysis of Tinospora cordifolia (Willd.) Miers and Its Adulterant Plant Using SEM and Cryostat. 2017. doi: 10.5530/pj.2017.1.8.

[9] Anjum V, Bagale U, Kadi A, Potoroko I, Sonawane SH, Anjum A. Unveiling Various Facets of Tinospora cordifolia Stem in Food: Medicinal and Nutraceutical Aspects. Molecules. 2023 Oct; 28(20):7073. doi: 10.3390/molecules28207073.

[10] Chowdhury P. In Silico Investigation of Phytoconstituents from Indian Medicinal Herb 'Tinospora cordifolia (giloy)' Against SARS-CoV-2 (COVID-19) by Molecular Dynamics Approach. Journal of Biomolecular Structure and Dynamics. 2021 Nov; 39(17): 6792-809. doi: 10.1080/07391102.2020.1803968.

[11] Rizvi ZA, Babele P, Madan U, Sadhu S, Tripathy MR, Goswami S *et al.* Pharmacological Potential of Withania somnifera (L.) Dunal and Tinospora cordifolia (Willd.) Miers on the Experimental Models of COVID-19, T Cell Differentiation, and Neutrophil Functions. Frontiers in Immunology. 2023 Mar; 14: 1138215. doi: 10.3389/fimmu.2023.1138215.

[12] Yates CR, Bruno EJ, Yates ME. Tinospora cordifolia: A Review of Its Immunomodulatory Properties. Journal of Dietary Supplements. 2022 Mar; 19(2): 271-85. doi: 10.1080/19390211.2021.1873214.

[13] Philip S, Tom G, Balakrishnan Nair P, Sundaram S, Velikkakathu Vasumathy A. Tinospora cordifolia Chloroform Extract Inhibits LPS-Induced Inflammation via NF-κB Inactivation in THP-1cells and Improves Survival in Sepsis. BioMed Central Complementary Medicine and Therapies. 2021 Mar; 21(1): 97. doi: 10.1186/s12906-021-03244-y.

[14] Nath H, Khataniar A, Bania KK, Mukerjee N, Al-Hussain SA, Zaki ME *et al.* Nano-Functionalization and Evaluation of Antimicrobial Activity of Tinospora cordifolia Against the TolB protein of Pseudomonas aeruginosa–An antibacterial and Computational Study. Frontiers in Microbiology. 2023 Apr; 14: 1138106. doi: 10.3389/fmicb.2023.1138106.

[15] Malabadi RB, Sadiya MR, Kolkar KP, Chalannavar RK, Baijnath H. Tinospora cordifolia (Amruthballi): Medicinal Plant with Anticancer activity. Magna Scientia Advanced Biology and Pharmacy. 2024 Mar; 11(02): 001-19. doi: 10.30574/msabp.2024.11.2.0017.

[16] Puri A and Patil S. Tinospora cordifolia Stem Extract-Mediated Green Synthesis of Selenium Nanoparticles and Its Biological Applications. Pharmacognosy Research. 2022; 14(3): 289-96. doi: 10.5530/ pres.14.3.42.

[17] Ali H and Dixit S. Extraction Optimization of Tinospora cordifolia and Assessment of the Anticancer Activity of Its Alkaloid Palmatine. The Scientific World

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DOI: https://doi.org/10.54393/pbmj.v9i8.1384

Journal. 2013; 2013(1): 376216. doi: 10.1155/2013/376216.

[18] George G, Shyni GL, Mohan S, Abraham B, Nisha P, Ranjith S *et al.* In Vitro and in Vivo Anti-Inflammatory and Anti-Arthritic Effect of Tinospora cordifolia Via Modulation of JAK/STAT Pathway. Inflammopharmacology. 2023 Apr; 31(2): 1009-25. doi: 10.1007/s10787-023-01155-7.

[19] Tiwari P, Nayak P, Prusty SK, Sahu PK. Phytochemistry and Pharmacology of Tinospora cordifolia: A Review. Systematic Reviews in Pharmacy. 2018; 9(1): 70-8. doi: 10.5530/srp.2018.1.14.

[20] Balkrishna A, Kumar A, Rohela A, Arya V, Gautam AK, Sharma H *et al.* Traditional Uses, Hepatoprotective Potential, and Phytopharmacology of Tinospora cordifolia: A Narrative Review. Journal of Pharmacy and Pharmacology. 2024 Mar; 76(3): 183-200. doi: 10.1093/jpp/rgae013.

[21] Chaudhary A, Das R, Mehta K, Mehta DK. Indian Herb Tinospora cordifolia and Tinospora Species: Phytochemical and Therapeutic Application. Heliyon. 2024 May; 10(10). doi: 10.1016/j.heliyon.2024.e31229.

[22] Antul K, Amandeep P, Gurwinder S, Anuj C. Review on Pharmacological Profile of Medicinal Vine: Tinospora cordifolia. Current Journal of Applied Science and Technology. 2019 Jun; 35(5): 1-1. doi: 10.9734/cjast/2019/v35i530196.

[23] Mishra A, Sharma K, Pandey J, Dev K, Kadan S, Sahai M *et al*. Tinosporaside from Tinospora cordifolia Encourages Skeletal Muscle Glucose Transport Through Both PI-3-Kinase- and AMPK-Dependent Mechanisms. Molecules. 2023 Jan; 28(2): 483. doi: 10.3390/molecules28020483.

[24] Masilamani SD, Chokkalingam P, Hari R. Characterization, Cytotoxicity and Anti-Oxidant Studies of Phytoniosome Loaded with Ethanolic Leaf Extract of Tinospora cordifolia. Avicenna Journal of Medical Biotechnology. 2023 Jul; 15(3): 196. doi: 10.18502/ajmb.v15i3.12930.

[25] Arunachalam K, Yang X, San TT. Tinospora cordifolia (Willd.) Miers: Protection Mechanisms and Strategies Against Oxidative Stress-Related Diseases. Journal of Ethnopharmacology. 2022 Jan; 283: 114540. doi: 10.1016/j.jep.2021.114540.

[26] Mandar BK, Khanal P, Patil BM, Dey YN, Pasha I. In Silico Analysis of Phytoconstituents from Tinospora Cordifolia with Targets Related to Diabetes and Obesity. In Silico Pharmacology. 2021 Jan; 9(1)3. doi: 10.1007/s40203-020-00063-w.

[27] Giannenas I, Sidiropoulou E, Bonos E, Christaki E, Florou-Paneri P. The History of Herbs, Medicinal and Aromatic Plants, and Their Extracts: Past, Current Situation and Future Perspectives. In Feed Additives. 2020 Jan: 1-18. doi: 10.1016/B978-0-12-814700-9.00001-7.

[28] Birla H, Rai SN, Singh SS, Zahra W, Rawat A, Tiwari N *et al*. Tinospora cordifolia Suppresses Neuroinflammation in Parkinsonian Mouse Model. Neuromolecular Medicine. 2019 Mar; 21(1): 42-53. doi: 10.1007/s12017-018-08521-7.

[29] Satruhan DK. A Review on Tinospora cordifolia: Biological and Medicinal Properties. Journal of Pharmaceutical Negative Results. 2022: 3929-40.

[30] Sajith KS and Farhan H. Pharmacological Effects of Tinospora cordifolia (Giloy) in Human Body. The Pharma Innovation Journal. 2022; 11: 07-10.

[31] Sharma U, Bala M, Kumar N, Singh B, Munshi RK, Bhalerao S. Immunomodulatory Active Compounds from Tinospora cordifolia. Journal of Ethnopharmacology. 2012 Jun; 141(3) :918-26. doi: 10.1016/j.jep.2012.03.027.

[32] Murshid GM, Kundu SK, Sohrab MH, Mazid MA. Pharmacological Overview of Tinospora cordifolia, an Ethnologically Important Plant of Bangladesh. Pharmacology and Pharmacy. 2022 Mar; 13: 93-106. doi: 10.4236/pp.2022.133007.

[33] Chandrasekaran CV, Mathuram LN, Daivasigamani P, Bhatnagar U. Tinospora cordifolia, A Safety Evaluation. Toxicology in vitro. 2009 Oct; 23(7): 1220-6. doi: 10.1016/j.tiv.2009.07.030.

[34] Payyappallimana U, Ravikumar K, Venkatasubramanian P. Can Guduchi (Tinospora cordifolia), A Well-Known Ayurvedic Hepato-Protectant, Cause Liver Damage? Journal of Ayurveda and Integrative Medicine. 2023 Jan; 14(1): 100658. doi: 10.1016/j.jaim.2022.100658.

[35] Ahmad S, Dubey SH, Tiwari AK, Prasad M. Pharmacological Review of Tinospora cordifolia: A Traditional Herb with Modern Therapeutic Relevance. International Journal of Pharmaceutical Chemistry and Analysis. 2025; 12(3): 145–151. doi: 10.18231/j.ijpca.77234.1762763176.

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