

**A Review On Phytochemistry And Medicinal Properties Of *Tinospora Cordifolia* (Giloy)****Prachi Aggarwal\*<sup>1</sup>, Archana Pathak\*\*<sup>2</sup>****Department Of Applied Chemistry \*<sup>1&2</sup>****MRSPTU****Bathinda****(Received:15June2020/Revised:10July2020/Accepted:22July2020/Published:28July2020)****Abstract**

*Tinospora cordifolia* is a woody climbing shrub widely used throughout India, China and Africa. The pharmaceutical significance of this plant is mainly because of root, stem and leaf. The phytochemicals investigation of Giloy proves its importance as a valuable medicinal plant. It constitutes various phytoactive compounds such as alkaloids, steroids, glycosides, lactones, polysaccharides and so on. This present review article put emphasis on pharmacological importance viz. antioxidant activity, antimicrobial activity, antibacterial activity, antifungal activity, antistress activity, anti-diabetic activity, anticancer, anti HIV potential, antitoxic effect, wound healing, anticomplementary activity, immunomodulating activity, systematic infections and Parkinson's disease.

**Keywords: *Tinospora Cordifolia*, Pharmacological Importance, Phytochemicals, Broiler, Metabolizability, Antibacterial Activities, FCR (Feed Conservation Ratio).**

**Introduction**

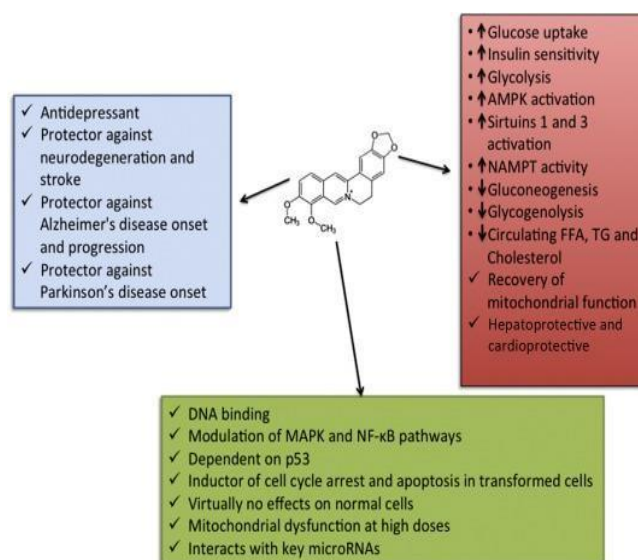
*Tinospora cordifolia*(Wild.)MiersexHook.F.& Thoms is a large, glabrous, deciduous climbing shrub. It belongs to the family Menispermaceae. Its Hindi name Giloy refers to a heavenly elixir used to stay off the aging and to stay young forever. The stem of *Tinospora cordifolia* are rather succulent with long filiform flashy aerial roots from the branches. The bark is creamy white to grey, deeply left spirally, the space in between being spotted with large rosette like lenticels. The leaves are membranous and cordate. The flowers are small and yellow or greenish yellow. The drupes are ovoid, glossy, succulent, red and pea sized. The seeds are curved. Fruits are flashy and single seeded. Flowers grow during the summer and fruits during the winter <sup>[1,2]</sup>. *Tinospora cordifolia* extract contains many constituents such as alkaloids, steroids, glycosides and polysaccharides <sup>[3]</sup>. The aqueous extract of *Tinospora cordifolia* has been shown to protect against *E.coli* and *Staphylococcus aureus* infections. <sup>[4,5]</sup>. The active ingredients, G 1-4A, of a dry stem of *Tinospora cordifolia* protected mice against lipopolysaccharides (LPS) <sup>[6]</sup>. Plants produce a diverse range of bioactive molecule, making them a rich source of different types of medicines. Free radicals or reactive oxygen species are formed in our body as a result of biological

oxidation. The over production of free radicals such as a hydroxyl radical, superoxide anionradical, hydrogenperoxide contribute to oxidative stress<sup>[7]</sup>. Medicinal plants are naturally very good antioxidant source where antioxidant activity is ascribed due to presence of phenolic,flavonoid Vitamins and secondary metabolites <sup>[8]</sup> .Use of Antioxidants in our diet protect against free radical by scavenging them. Hence, there is an increasing interest study the effects of various extraction factors on the phytochemical substances including phenolic, flavonoids, and active ingredients, essential oils, amino acid and carotenoids<sup>[9]</sup>

### Pharmacognostic Activities

The plant is used to improve the immune system and the body resistance against infections. The root of this plant is known for its anti-stress and anti-malarial activities. The stem is bitter, stomachic, diuretic, stimulates bile secretions, allays thirst, enriches the blood and cures jaundice. The extract of the stem is useful in skin problems. The root and stem of *Tinospora cordifolia* is prescribed in combination with other drugs as an antidote to snakebite and scorpion. The plant is also used in the treatment of wounds, pneumonia, asthma and cough. *Tinospora cordifolia* has anti-cancer, immune stimulating, nerve cell protecting, anti-diabetic, cholesterol-lowering and liver-protective actions. *Tinospora cordifolia* is also responsible for decreasing the tissue damage caused by radiation, the side effects of some forms of chemotherapy and speeding healing of diabetic foot ulcers .

Different pharmacological activities of *Tinospora cordifolia* has been reported by the researcher, which has been described as follows:



### Antidiabetic Potential

Various phytoconstituents isolated from different parts of *Tinospora cordifolia* are responsible for cure

of diabetes. These phytochemicals include alkaloids, tannins, cardiac glycosides, flavonoids, saponins and steroids. It has the magical potential of lowering the blood sugar level in human beings. The isoquinoline alkaloid rich 'berberin' is reported to be highly effective for human diabetes. It lowers elevated glucose level as effectively as metformin. It also improves hepatic metabolism during insulin resistance. By adenosine monophosphate-activated protein kinase activation, it decreases the blood sugar and cholesterol level and maintains the blood pressure <sup>[26,27]</sup>. Crude values for food content in *Tinospora cordifolia* include high fibre (15.19%), sufficient protein (4.5%-11.2%), sufficient carbohydrates (61.66%) and low fat(3.1%). In a diabetic rat model, *T.cordifolia* root extracts of Guduchi attenuated the brain mediated lipid level and down-regulated the blood glucose and urinary glucose level emphasizing its anti-diabetic and lipid-lowering activity <sup>[28]</sup>. The root extract of Guduchi showed an antihyperglycemic effect in the alloxan-induced diabetic model by decreasing its excess glucose level in urine as well as in normal <sup>[29]</sup>.

### **Antimicrobial Potential**

The anti-microbial activity of *T.cordifolia* with different micro-organisms like *E.coli*, *Staphylococcus aureus*, *Salmonella typhi*, *Salmonella paratyphi*, *Pseudomonas aeruginosa* and *Serratia marcescens* showed good antifungal and anti-bacterial activity. It showed good therapeutic activity on the infectious disease against both gram-positive and gram-negative bacteria. The aqueous, ethanol and acetone extracts of *T.cordifolia* showed maximum inhibitory activity against on clinical isolates of urinary pathogens. The antibacterial activity of silver Nano particles synthesized from stem of *Tinospora cordifolia* is good against different drug resistant strains of *Pseudomonas aeruginosa* isolated from burn patients. Some active compounds was isolated from ethanol extract of *Tinospora cordifolia* stem showed activity against bacteria and fungi.

### **Antitoxic Potential**

The antioxidant present in aqueous extracts of Giloy scavenge the free radicals generated during alfatotoxicosis. Giloy extracts prohibits the liver damage induced by lead nitrate. The anti-toxic potential of *Tinospora cordifolia* is showed due to its ability to increase the level of ascorbic acid, glutathione, protein and the activities of anti-oxidant enzymes i.e. Catalase, Superoxide Dismutase, Glutathione peroxidase, glutathione reductase in kidney GPx enzyme, Glutathione S-transferase (GST). It showed protective effect against aflatoxin- induced nephrotoxicity due to presence of some alkaloids in *Tinospora cordifolia* such as choline, *Tinosporin*, *Isocolumbin*, *palmatine*, *Tetrahydropalmatine* and *Magnoflorine*<sup>[15]</sup>. In Swiss albino male mice, the hepatoprotective effect has been shown by the extracts of stem and leaves of *Tinospora cordifolia* against lead nitrate induced toxicity. There is increase in the

activities of SOD and CAT and decreased the level of AST, ALT, ALP and ACP enzymes due to synergistic administration of aqueous extracts of stem and leaf of *T.cordifolia*.

### **Anti Stress Potential**

The ethanol extract of *Tinospora cordifolia* at the dose of 100mg/kg gives significant anti-stress activity in all the parameters compared with the standard tranquilizers used to relieve anxiety and relax muscles. *Tinospora cordifolia* extracts also shows the properties of brain tonic by increasing mind power like memory and recollection. The plant extract of *T. cordifolia* has mainly down regulated the over activity of sympathetic nervous system. *T.cordifolia* can be taken as a prophylactic agent to prevent the long-term chemical changes in the body and related adverse consequences on the heart and other body system due to chronic activation of the sympathetic nervous system. The root of *T. cordifolia* is known to be used traditionally for its anti-stress activity. In a 21-day randomized, controlled study, the pure aqueous extract of the root was found to enhance verbal effects in mammals. Beta-Ecdysone (Ecd) from *Tinospora cordifolia* extracts have been reported to induce a significant increase in the thickness of joint cartilage, induce the osteogenic differentiation in mouse mesenchymal stem cells [32] and to relieve osteoporosis in osteoporotic animal models [32]. Further 20-OH- $\beta$ -Ecd isolated from *Tinospora cordifolia* has been reported of its anti-osteoporotic effects [31] thus highlighting the role of *Tinospora cordifolia* in the treatment of osteoporosis and osteoarthritis[33].

### **Parkinson's Disease**

Parkinson's disease (PD) is a movement disorder characterized by the loss of dopaminergic neurons in the region of the mid brain. *Tinospora cordifolia* plays neuroprotective role by reducing the progression of neuro-inflammation and increasing the level of TH in case of MPTP-treated PD mouse model. *Tinospora cordifolia* contain strong antioxidant which can be used as potential therapeutic drug in neurodegenerative disorders. *Tinospora cordifolia* shows neuroprotective role by increasing the level of Tyrosine Hydroxylase and decreasing the level of TNF-  $\alpha$  and NF- $\beta$ .

### **Anti-oxidant Potential**

Various solvents namely hexane, chloroform, ethyl acetate, acetone, methanol and water were used sequentially for extracting antioxidant compounds from leaf and stem of *T.cordifolia*. The antioxidant capacity of solvent extracts of leaf and stem of *Tinospora cordifolia* were evaluated by various scavenging effects on DPPH(1-diphenyl-2-picrylhydrazyl), hydroxyl radical and ferric reducing antioxidant power (FRAP) were found to be highest in methanolic extract of leaf and ethyl acetate extract of stem compared to all other extracts. Stem extracts showed to be the more effective antioxidant source than the leaf extracts with regard to all the radical scavenging activities. *Tinospora*

cordifolia extracts possess possible inhibitors of aldose reductase and anti-oxidant agent thereby reducing chemotoxicity induced by free radicals. In alloxan- induced diabetic rats the methanolic, ethanolic, and water extracts of *Tinospora cordifolia* for their antioxidant activity, in which the ethanol extract of stem increased the erythrocytes membrane lipid peroxide and decrease the Superoxide Dismutase (SOD) and glutathione peroxidase(GPx). It also modifies the different enzymatic system which controls the production of reactive species and maintain the oxidative load by regulating the lipid peroxidation process and glutathione level<sup>[34,35]</sup>.

### **Hepatic Disorder**

Heavy alcohol intake depletes the plasma vitamins due to hepatotoxicity and decreased intestinal absorption. The effects of chronic moderate alcohol intake on liver and intestine were showed using urinary vitamin levels. Furthermore, effects of *Tinospora cordifolia* water extract (TCE) (hepatoprotective) on vitamin excretion and intestinal absorption shows a significant increase in the level of gamma-glutamyl transferase, cholesterol, Triglyceride in alcoholic sample whereas the level get down-regulated after TCE intervention, patients showed the normalized liver function<sup>[36]</sup>.

### **Boost Immunity**

This Ayurvedic herb is a powerhouse of antioxidants that neutralise free radicals and prevent inflammation. Also, it purifies blood, boosts immunity, flushes out toxins from the body and fights against bacteria and virus effectively. Consuming Giloy juice can help you get rid of fever, which is one of the signs of COVID-19. Its anti-inflammatory properties help in tackling respiratory problems like cough, cold, and breathing problems. These are also major signs of the novel coronavirus infection. It is used as a *rasayanato* improve the immune system and body resistance against infections. The whole plant is used medicinally; however, the stem is approved for use in medicine as listed by the Ayurvedic Pharmacopoeia of India. This is due to higher alkaloid content in the stems than in the leaves. It is a traditional belief that *Guduchi satva* obtained from the *Guduchi* plant growing on *neem* tree is more bitter and more efficacious and is said to incorporate the medicinal values of *neem*.

### **Liver Diseases**

Liver injury due to an overdose of alcohol can be managed by using Guduchi Satwa, an Ayurvedic formulation prepared from Giloy. It acts by lowering total cholesterol level in the liver. It also improves the level of antioxidant enzymes (reduces damage by free radicals) and oxidative-stress markers thereby enhancing overall liver function. Giloy helps to improve metabolism and liver functions due to its Deepan (appetizer) and Pachan (digestive) properties. Giloy also inhibits degeneration and promotes new cell growth due to its Rasayana (rejuvenating) quality.

### **Effects Of Dietary Inclusion Of *Tinospora Cordifolia* (Giloy)**

Indian poultry industry has made a tremendous and remarkable progress from a small scale backyard to the status of commercial, full-fledged, self-sufficient, agro based industry<sup>[38]</sup>. Feed additives are one of the important tools used for improving the feed conversion ratio (FCR), growth rate, disease resistant due to immunity. Feed additives are the non –nutrient substance which accelerates growth<sup>[39]</sup>. The feed additives that hold great promise in the feeding of poultry comprises of antibiotics, anti-oxidants, enzymes, hormones, organic acid, herbal products etc. Longer use of antibiotics has resulted into negative effects such as residue in tissue. The use of various herbs as dietary additives may positively affect poultry health and productivity. Herbal feed additives showing immuno modulatory activity have been used instead of drugs because of their low toxicity for the host system, adequate absorption and capability to reach the target organ without much degradation by host enzyme<sup>[40]</sup>. Furthermore, these herbal feed additives have no side effects on the health of birds and increase the performance of broiler by increasing live weight gain, food conversion ratio<sup>[41]</sup> and immunity<sup>[42]</sup>.

Oral administration of alcoholic *T. cordifolia* (100 mg/kg body weight) induced a significant elevation in **TBARS** (Thiobarbituric acid reactive substances) in the liver ( $0.78 \pm 0.03$ ) and kidney ( $0.42 \pm 0.06$ ) compared with normal rates ( $0.78 \pm 0.06$  and  $0.41 \pm 0.08$ , respectively). There was also a significant decrease in liver GSH ( $50.8 \pm 2.4$ ) compared with normal levels ( $51.4 \pm 3.9$ )<sup>[43]</sup>; in addition, the mean body weight gain of treated birds was increased significantly ( $P = 0.05$ ) after 6 week of age compared with that of control birds (1,165 g vs. 1,148 g, respectively), and the mean FCR of treated birds was significantly ( $P < 0.05$ ) lower than that of control birds (1.45 vs. 1.54, respectively)<sup>[44]</sup>. *T. cordifolia* is known to enhance general immunity, prevent oxidative stress and different diseases, increase leukocyte counts, and decrease neutropenia in rats<sup>[45]</sup> showed that dietary supplementation with *T. cordifolia* significantly improved humoral and cellular immunity in broilers, and the maximum antibody titer was observed in groups fed with *T. cordifolia*.

### **Conclusion**

In the light of above review, it can be concluded that aqueous and alcoholic extracts of *T. Cordifolia* established the immunomodulatory, antimicrobial, hepatoprotective, antioxidant activity, antifungal activity, antibacterial activity, anti HIV potential, Antitoxic activity, Anti-osteoporotic, anti-arthritis, potential, systemic infection and Parkinson's Disease, Liver disorder, Antidiabetic activity, Anticancer activity and Antioxidant activity. It is reported that *T. cordifolia* contain strong antioxidant which can be used as potential therapeutic drug in neurodegenerative disorders. Antioxidant properties are thought to

be a key mechanism in improving cognition, concentration and memory, which provides potential benefits in Alzheimer's disease and attention deficits hyperactivity disorder.

Other common uses of Giloy include treatment of ailments such as cardiac debility, anaemia, leprosy, and jaundice. It has also been considered quite effective against swine flu. Also, dietary supplementation of Giloy was as effective as antibiotic growth promoters. Better growth performance of birds in terms of body weight gain, improved FCR and resulted in better nutrient metabolizability, has been shown by *T. cordifolia*. Therefore. It can be concluded that Giloy powder can effectively replace the antibiotic growth promotor when its dietary level is at 0.50% It is also concluded that: Giloy, a popular herb among naturopaths, is today gaining immense popularity and has found its way in the preparation of many medicines. Recently, a study was conducted by a group of scientists at the IIT Delhi, in collaboration with AIST, Japan. They found that Giloy does have strong potential in fighting the novel coronavirus. This herb helps us being in good health and reduce risk of being critically ill after contracting the coronavirus infection.

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