

# Tinospora cordifolia (Giloy) and its pharmacological effects on the human body

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## ABSTRACT

Bioactive chemicals are utilized to create several drugs with significant pharmacological benefits. *Tinospora cordifolia* (Giloy), a medicinal plant in the Menispermaceae family, is a significant source of new medications and health care products. Giloy has numerous medical features, medicinal uses, and phytochemical study suggest its significance as a superb medicinal herb. Anti-inflammatory, anti-oxidant, anti-spasmodic, anti-allergic, and anti-HIV The anti-cancer properties have been documented. The primary stem of the plant is bitter, stomachic, and diuretic. Increases bile output and treats jaundice. This review paper highlights the pharmacological potential of *T. cordifolia* and the phytochemicals that contribute to its actions.

**Keywords:** *Tinospora cordifolia*, anti-inflammatory, anti-allergic, anti-oxidant, ayurvedic

## I. INTRODUCTION

According to the World Health Organization (WHO), 75% of people use traditional remedies to treat or prevent illnesses. Plants produce diverse bioactive chemicals, making them valuable sources of various medications. *Tinospora Cordifolia* is a deciduous climbing, big shrub belonging to the family Menispermaceae. (Rana et al., 2012)<sup>[17]</sup>. This plant is extensively distributed in India, Burma, China, and Myanmar. Giloy and Heart-leaved moonseed are common names for this plant, which grows in Sri Lanka. Other synonyms and common names are Guduchi, Amrita, Guduchika. According to Narayana (2008), many Indian languages include Chinnobhava, Vatsadani, Kundalini, Gulancha, Gurcha, Gala, Amrutavalli, Gilo, Seendal, and Amarlata.<sup>[13]</sup> *Tinospora cordifolia* has recently generated a lot of interest among academics all around the world because Some of its purported therapeutic characteristics include anti-periodic, anti-inflammatory, anti-arthritic, antioxidant, anti-allergic, hepatoprotective, immunomodulatory, and anti-neoplasticism activity.

(Soham, Shyamasree, 2012)<sup>[24]</sup>. A range of active chemicals originating from plants, include as Alkaloids, steroids, diterpenoid lactones, and glycosides were isolated from various sections. Upadhyay et al. (2010) define the plant body as the stem, root, and entire plant.<sup>[27]</sup>

## II. PHARMACOLOGY

*Tinospora cordifolia* contains a diverse range of compounds, including alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoids, and polysaccharides. The structure of these compounds was determined on the basis of Spectroscopic studies (Maurya et al., 2004)<sup>[11]</sup>. This has been utilized in Ayurvedic preparations for treating a variety of illnesses. It is also used as Rasayana to boost the immune system and body resistance.

### 2.1. ANTI-ALLERGIC PROPERTIES

*Tinospora cordifolia* is commonly used to treat asthma and persistent coughs (Spelman, 2001) [25]. A clinical investigation found that *T. cordifolia* effectively alleviated sneezing in 80% of participants. Similarly, 65% reported relief from nasal discharge, 66% from nasal obstructions, and 75% from nasal pruritus. Just 20% of patients in the placebo group experienced relief from sneezing, 15% from nasal discharge, and 18% from nasal obstruction, and 17% with nasal pruritus. As a result, *T. cordifolia* dramatically decreased. All allergic rhinitis symptoms are alleviated while remaining tolerable. An aqueous extract of the stem was examined for its anti-allergic and bronchodilator activities against histamine-induced bronchospasm in guinea pigs, capillary permeability in mice, and mast cell disruption in rats. It was found to considerably reduce bronchospasm and capillary permeability. increases the quantity of damaged mast cells (Badar et al., 2005).<sup>[2]</sup>

## 2.2. ANTIOXIDANT ACTIVITY

Diabetic rats had higher concentrations of TBARS in their brain and lower levels in their hearts. Treatment with *Tinospora cordifolia* lowered glutathione. GSH reductase concentrations and superoxide activity SOD, catalase, and glutathione peroxidase (GPx) in diabetic rat tissues. *T. cordifolia* root, alcoholic extract (TCREt) was administered orally to diabetic rats at a dose of 100 mg/kg For 6 weeks, restored the antioxidant status of the heart. brain. However, insulin (6 units/kg) restored all parameters to Normal status, *T. cordifolia* root extract was more effective than glibenclamide (600/kg) (Prince et al., 2004) <sup>[16]</sup>. Fenton (FeSO<sub>4</sub>) reaction and radiation-mediated 2-Aqueous solutions reduced both deoxyribose degradation. extract of *T. cordifolia* in a dose-dependent fashion, with an The IC<sub>50</sub> value is 700/mL for both Fenton and radiation-mediated 2DR deterioration. Similarly, at 500/mL or greater, exhibited a moderate, dose-dependent reduction of The chemically generated superoxide anion has an IC<sub>50</sub> value of 2000/ml (Goel et al., 2002) <sup>[5]</sup>. *T. cordifolia* has been linked to elevated GSH levels, gamma-glutamylcysteine ligase expression, and Cu-Zn SOD gene expression. Electron Paramagnetic resonance Spectroscopy showed that the plant exhibited strong free radical scavenging abilities against reactive Rawal et al. (2004) discuss oxygen and nitrogen species. <sup>[19]</sup>. *Tinospora cordifolia* includes components that diminish HIV recurrent resistance to antiretroviral treatment (ART). Improve the medication's outcome. The liver of Swiss Albino mice, the effect of a hydroalcoholic (80%) ethanol: 20% distilled water) *Tinospora* extract *Cordifolia* aerial roots on carcinogen/drug metabolism phase I and phase II enzymes, Antioxidant enzymes, GSH concentration, LDH, and lipid peroxidation were identified. *Tinospora cordifolia* has chemopreventive action, as suggested by Increased GSH levels and enzyme activity involved in Xenobiotic metabolism and cell antioxidant state (Singh et al., 2006) <sup>[22]</sup>.

## 2.3. ANTI-DIABETIC ACTIVITY

*Tinospora cordifolia* stems are used in traditional Indian folk medicine to cure diabetes and regulate blood glucose levels. It has been suggested that it has antidiabetic benefits by lowering oxidative stress (OS). Increasing insulin secretion while lowering gluconeogenesis and glycogenolysis, which all contribute to blood regulation. glucose levels. *Tinosporacordifolia*'s principle phytoconstituents, including alkaloids, tannins, and cardiovascular Glycosides, flavonoids,

saponins, and steroids have Sangeetha et al. shown that it has anti-diabetic activities. 2011) <sup>[20]</sup>. Both in vitro and in vivo, the isoquinoline alkaloid-rich portion of the stem, which includes palmatine, Jatrorrhizine and magnoflorine have been demonstrated to exhibit Insulin-like and insulin-releasing actions. <sup>[10]</sup>Root Extracts have been demonstrated to reduce blood glucose levels. Increase insulin production while inhibiting OS signs. taken orally

In vitro investigations have demonstrated the activation and restoration of cellular antioxidant indicators, including superoxide dismutase (SOD) and glutathione peroxidase (GPx), and glutathione (GSH), together with the suppression of glucose 6- Phospase and fructose 1, 6-diphosphatase and the Restoration of glycogen content in the liver (Patel and Mishra 2011) <sup>[15]</sup> In diabetic rats, the root extract reduced glycosylated hemoglobin, plasma thiobarbituric acid reactive. compounds, hydroperoxides. Check levels of ceruloplasmin and vitamin E. *Tinospora cordifolia* extract is administered orally using the "Ilogen-Excel" formulation, an Ayurvedic herbal supplement. formulation) consisting of eight medicinal herbs, including *Curcuma longa*, *Strychnos potatorum*, *Salacia oblonga*. *Tinospora cordifolia*, *Vetivellia zizanioides*, and *Coscinium Fenestratum*, *Andrographis paniculata*, and *Mimosa pudica*, has been proven to lower GSH levels in the heart and brain of Diabetic rats exhibit reduced levels of GSH, GPx, and SOD, as well as reduced catalase activity (Umamaheswari and Prince, 2007) <sup>[26]</sup>

## 2.4. ANTI-MICROBIAL ACTIVITY

*Tinospora cordifolia* methanol extracts can effectively treat microbiological diseases. *Tinospora cordifolia* extracts were evaluated for their antibacterial efficacy against *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Proteus Vulgaris*, *Salmonella typhi*, *Shigella flexneri*, *Salmonella Paratyphi*, *Salmonella typhimurium*, and *Pseudomonas P. aeruginosa*, *Enterobacter aerogene*, and *Serratia marcescens* (Gram-positive bacteria; Narayanan et al., 2011) <sup>[14]</sup>. TCE has been demonstrated to help bacterial clearance and enhance neutrophils. phagocytic and intracellular bactericidal capabilities in mice models. On macrophages, TCE has Immunostimulant effects. In bovine preclinical mastitis, intramammary infusion of hydromethanolic extracts of *Tinospora Cordifolia* treatment enhanced

polymorphonuclear cells. Sengupta et al. (2011) reported phagocytic activity.<sup>[21]</sup>

## 2.5. ANTI-CANCER ACTIVITY

*Tinosporacordifolia*'s anti-cancer activities are primarily studied in animal models. TCE has been shown to protect male Swiss albino mice from radio exposure. Increasing body weight, tissue weight, and testicular weight. ratio and tubular diameter, while also limiting the harmful Effects of sublethal gamma radiation on the testes. TCE has a Significant effect on the radiation-induced rise in lipids Peroxidation in pre-irradiated animals, resulting in a decrease in GSH levels in the testes. TCE Pretreatment of HeLa Cells were discovered to impair cell viability, raise LDH, and Reduce GSH S-transferase activity. TCE with DHT promotes the growth and proliferation of human LNCaP cells. Are androgen-sensitive human prostate cancer cells. Kapur et al., 2009.<sup>[9]</sup> Higher levels of pro-inflammatory cytokines, including IL-1, IL-6, TNF-, granulocyte monocyte colony stimulating factor (GM-CSF), and the vascular endothelial cell growth factor (VEGF) was also enhanced. Production of anti-angiogenic substances, IL-2, and tissue inhibitor metalloprotease-1 (TIMP-1) were discovered in the B16-F10.extract-treated animals, suggesting TCE's anti-angiogenic *Tinospora cordifolia* polysaccharide components were discovered to be Particularly helpful in lowering the metastatic potential of B16-F10 melanoma cells. Leyton and Kuttan (2004) found that treated mice showed significantly lower levels of neoplastic development compared to untreated controls.<sup>[10]</sup> *Tinospora cordifolia* enhanced acid-soluble sulfhydryl (-SH). The contents and enzyme activity of cytochrome P (450) cytochrome P (450) reductase, cytochrome b5 reductase, GST, DTD, SOD, catalase, GPX, and GR. Activity in the liver of Swiss albino mice, highlighting the Chemoprevention role (Singh et al., 2006).<sup>[22]</sup>

## 2.6. ANTI-HIV EFFECT

TCE has been shown to diminish HIV recurring resistance, boosting therapeutic success. TCE reduced eosinophil counts and activated B cells and macrophages, indicating anti-HIV activity. Polymorphonuclear leucocytes, and a reduction in hemoglobin %, indicating that it is promising. Function in disease management (Kalikata et al., 2008).

## 2.7. ANTIPYRETIC ACTIVITY :

*T. cordifolia* is traditionally known for its jwarahara (antipyretic) properties. The water-soluble component of a 95% ethanolic extract demonstrated antipyretic effectiveness. *T. Cordifolia*. *T.* has hexane- and chloroform-soluble components. *Cordifolia* stems were discovered to have antipyretic effects. Another experiment. *T. cordifolia* is anti-infective Several studies have found antipyretic effects. Pretreatment with *T. cordifolia* protected rats from mortality. Caused by intra-abdominal sepsis after coecal ligation, *E. coli*-induced mortality is greatly reduced. Jayachandran et al. (2003) studied peritonitis in mice.

## 2.8. IMMUNOMODULATORY ACTIVITY:

*Tinospora cordifolia* is said to have revitalizing, tonic, anti-aging, life-extending, and aphrodisiac properties. *Chakshusya* (useful for eye problems) features in Ayurveda. *T. cordifolia* extracts (alcoholic and aqueous) Have been successfully investigated for their immunomodulatory actions, which have been reported to have Positive impacts on the immunological system. using Photosensitization, concurrent therapy with G1-4A/PPI. (partially purified immunomodulator) of *T. cordifolia* Significantly reduced protein breakdown as determined by Sodium dodecyl sulfate-polyacrylamide gel electrophoresis SDS-PAGE (Dikshitar et al., 2000; Desai et al., 2002). The plant's new (1,4)-alpha-D-glucan activates TLR6 signaling, NFkappaB translocation, and cytokine synthesis, so engaging the immune system. NFkappaB activates macrophages via TLR6 signaling. translocation, and cytokine production. The enhanced Production of antiangiogenic substances, IL-2, and tissue inhibitor Metalloprotease-1 (TIMP-1) in the B16F10-injected Extraction-treated rats reveal that *Tinospora cordifolia* modulates Cytokines rise differently. *T. cordifolia*'s antiangiogenic effects is associated with the regulation of cytokines and growth factors in The bloodstream. The aqueous extract of *T. cordifolia* was found toIt is reported to improve phagocytosis. In vivo, both watery Furthermore, ethanolic extracts boosted antibody production. Nair et al., 2006; Ranjith et al., 2008)<sup>[18,12]</sup>.

### III. CONSTITUENTS OF TINOSPORA CORDIFOLIA (SINGH ET AL., 2003)<sup>[23]</sup>:

Types of Chemicals	Principles	Parts
Alkaloids	Barberine, Palmatine, Tembetarine	Stem and Root
Steroids	Hydroxy ecdysone	Stem
Sesquiterpenoid	Tinocordifilin	Stem
Diterpenoid Lactones	Furanolactone	Whole plant
Glycosides	Tinocordiside, Cordioside, Syringing, cordifiside.	Stem
Aliphatic compounds	Octacosanol, Heptacosanol	Whole plant
Miscellaneous	Nonanosan-15-one	Whole plant



### IV. CONCLUSION

Tinospora cordifolia, a traditional Ayurvedic herb, has modern data to support its effectiveness. pharmacotherapeutics. All the chemicals found in this demonstrate the immunomodulatory and physiological role of diverse categories, which are caused by numerous kinds of Phytochemicals in giloy have found applications in pharmacological, antihyperglycemic, antitumor, and HIV properties. The future area of review will focus on using the T.

cordifolia signaling pathways and biochemicals are active. Components for effective disease targeting. Tinospora is a valuable resource in the scientific field of medicine because it has so much to offer.

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