

## *Tinospora cordifolia*: An immense value medicinal plant

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# ***Tinospora cordifolia*: An immense value medicinal plant.**

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**Abstract-** *Tinospora cordifolia* comes under the class Magnoliopsida, order Ranunculales and belongs to the Menispermaceae family. The species is widely distributed in India. The plant is large, glabrous deciduous climbing shrub. The stems are rather succulent with long filiform fleshy aerial roots form the branches. The bark is grey brown and watery. The leaves are membranous and cordate. The flowers are small and greenish yellow in color. In this present research work we can study this plant botanical, taxonomic as well as its medicinal value.

**Keywords-** *Tinospora cordifolia*, Ranunculales, Menispermaceae, Botanical value, Taxonomic value and Medicinal value.

## **TAXONOMIC DESCRIPTION**

Kingdom: Plantae

Division: Magnoliophyta  
Class: Magnoliopsida  
Order: Ranunculales  
Family: Menispermaceae  
Genus: Tinospora  
Species: cordifolia

### **The family Menispermaceae**

The plant family Menispermaceae consists of about 70 genera and 450 species that are found in tropical lowland regions. They are generally climbing or twining, rarely shrubs. Leaves are alternate or lobed, flowers small cymose, seeds usually hooked or reniform. This family is rich source of alkaloid and terpenes.

### **The genus Tinospora**

Tinospora is one of the important genera of the family, consisting of about 15 species. Some medicinally important species includes *T. Cordifolia*, *T. Malabarica*, *T. Tementosa*, *T. Crispa*, *T. Uliginosa*, etc.

### **The species *Tinospora cordifolia***

*Tinospora Cordifolia* (wild) Miers ex Hook. F and Thoms belonging to the family Menispermaceae is a large deciduous climbing shrub found

throughout India and also in Srilanka, Bangladesh and China (Raghu *et al.*, 2006)

### **Common Names**

Latin : *Tinospora cordifolia* (Willd.) Hook.f. & Thomson

English : Tinospora Gulancha / Indian tinospora

Sanskrit : Guduchi, Madhuparni, Amrita, Chinnaruha, Vatsadaani, Tantrika

Kundalini and Chakralakshanika

Hindi : Giloya, Guduchi

Bengali : Gulancha

Telugu : Tippaatigo

Tamil : Shindilakodi

Marathi : Shindilakodi

Gujarati : Galo

Kannada : Amrita balli

## **Botanical Discription**

A large, glabrous deciduous climbing shrub. The stems are rather succulent with long filiform fleshy aerial roots form the branches. The bark is grey brown and watery. The leaves are membranous and cordate. The flowers small and greenish yellow. This herb is found throughout tropical asia ascending to a height of 300 mts .

**Stems-** Fleshy, erect and green in color.

**Roots-** Long thread like, aerial, arise from branches.

**Bark-** Thin, greyish or creamy white in colour, when peeled fleshy stem is exposed.

**Leaves-** Cordate (heart shaped), membranous and juicy .

**Flowers** - Bloom during summer.

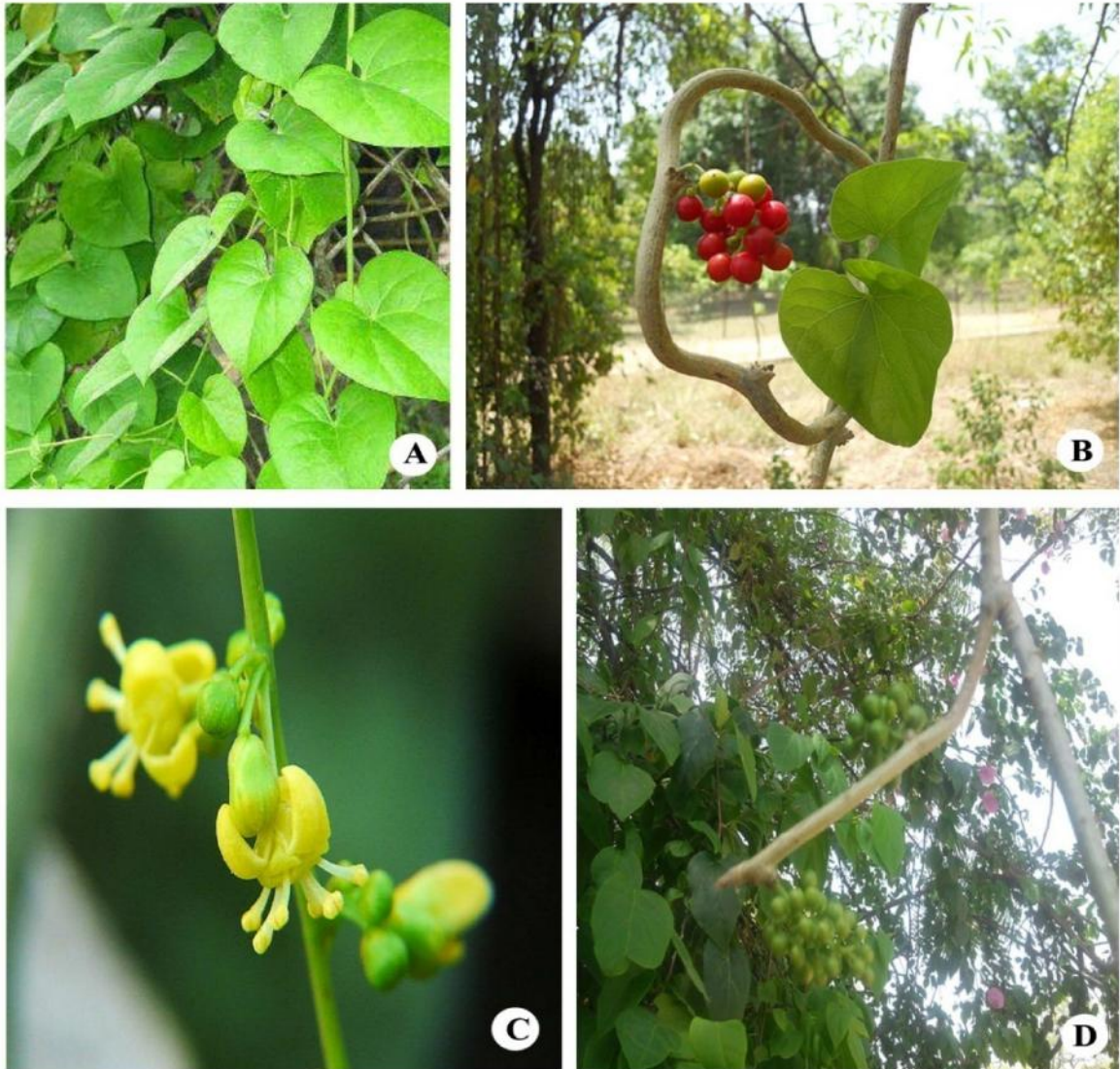
Male flower - Small, yellow or green coloured occur in clusters .

Female flowers - Occur singly.

**Fruits** - Pea shaped, fleshy, shiny turn red when boiled. Occurs only in winter .

**Seeds** – Berry and pea in sized .

## PLATE-2.1



**A- Leaves of *Tinospora cordifolia***  
**B-Flowers of the *Tinospora cordifolia***  
**C- Fruits of *Tinospra cordifolia***  
**D-Whole plant of *Tinopsra cordifolia***

## **Taxonomic Discription**

The plant *Tinospora cordifolia* comes under the class Magnoliopsida, order Ranunculales and belongs to the Menispermaceae family. The species is widely distributed in India, extending from the Himalayas down to the southern part of peninsular India. It is also found in neighboring countries like Bangladesh, Pakistan, and Srilanka. The plant is also reported from South East Asian countries such as Malaysia, Indonesia, and Thailand etc.

## **Habitat**

*Tinospora cordifolia* prefers wide range of soil, acid to alkaline and it needs moderate level of soil moisture. Found throughout tropical India ascending to an altitude of 1000 feet and found in South Asia, Indonesia, Philippines, Thailand, Myanmar, China and in Srilanka worldwide.

## **Chemical Composition**

A variety of constituents have been isolated from different parts of *Tinospora cordifolia*. They belong to different classes such as alkaloids, diterpenoid lactones, steroids, glycosides aliphatic compounds, polysaccharides. Some important constituents have been isolated from plant mainly they are tinosporone, tinosporic acid, cordifolisides A to E, syringen, berberine, giloin, gilenin, crude giloininand, arabinogalactan polysaccharide, picrotene, bergenin, gilosterol, tinosporol, tinosporidine, sitosterol, cordifol, heptacosanol, octacosonal, tinosporide, columbin, chasmanthin, palmarin, palmatosides C and F, amritosides, cordioside, tinosponone, ecdysterone,

makisterone A, hydroxyecdysone, magnoflorine, tembetarine, syringine, glucan polysaccharide, syringine apiosylglycoside, isocolumbin, palmatine, tetrahydropalmatine, jatrorrhizine respectively, [Singh *et al.*, 2003].

### **Medicinal Property**

The plant possesses anti-oxidant, anti-hyperglycemic, anti- neoplastic, anti- stress, anti- dote, anti- spasmodic, anti- pyretic, anti allergic, anti-leprotic anti- inflammatory, antihyperlipidaemia, Immunomodulatory properties. Various parts of the plant contain immense medicinal properties.

### **Immunomodulatory property**

Subramanian *et al.*, (2002) demonstrated the immunomodulatory property of *Tinospora cordifolia*. He studied some active compounds i.e. 11-hydroxymustakone, N-methyl-2-pyrrolidone, N-formylannonain, cordifolioside A, magnoflorine, tinocordiside and syringing which shows potential immunomodulatory and cytotoxic effects. In mice, *Tinospora cordifolia* extracts have shown to result in up-regulation of IL-6 cytokine, resulting in acute reactions to injury, inflammation, activation of cytotoxic T cells, and B cell differentiation (Sudhakaran *et al.*, 2006). Jahfar, (2003) has reported active compounds in aqueous extracts like alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds or polysaccharides in experimental rat model for their cytotoxic action. Dry stem crude extracts of *Tinospora cordifolia* with a polyclonal B cell mitogen, G1-4A on binding to macrophages have been reported to



enhance immune response in mice by inducing secretion of IL-1, together with activation of macrophages

### **Anti-diabetic property**

Sangeetha *et al.*, (2011) proved the stem of *Tinospora cordifolia* for the therapy of diabetes by regulating the blood glucose. It has been reported to mediate its anti-diabetic potential through mitigating oxidative stress (OS), promoting insulin secretion and also by inhibiting gluconeogenesis and glycogenolysis, thereby regulating blood glucose. In this string P S *et al.*, (2011) have reported alkaloids, tannins, cardiac glycosides, flavonoids, saponins, and steroids as the major phytoconstituents of *Tinospora cordifolia* which play an anti-diabetic role.

The isoquinoline alkaloid rich fraction from stem, including, palmatine, jatrorrhizine, and magnoflorine have been reported for insulin-mimicking and insulin-releasing effect both *in vitro* and *in vivo* (Patel *et al.*, 2010). Oral treatments of root extracts have been reported to regulate blood glucose levels, enhance insulin secretion. The crude stem ethyl acetate, dichloromethane (DCM), chloroforms and hexane extracts of *Tinospora cordifolia* inhibited the enzyme's salivary and pancreatic amylase and glucosidase (Chougale *et al.*, 2009) thus increasing the post-prandial glucose level and finds potential application in treatment of diabetes mellitus.

Umamaheswari *et al.*, (2007) have reported oral administration of root extract of *Tinospora cordifolia*, it decreases the levels of glycosylated hemoglobin, plasma thiobarbituric acid reactive substances, hydroperoxides, ceruloplasmin and diabetic rats. Decreased concentration of GSH, GPx, and

SOD, catalase activity has been reported in heart and brain of diabetic rats (Prince *et al.*, 2004).

Stanely *et al.*, (2000) have reported that *T. cordifolia* root extract (TCE), which increased the body weight, total hemoglobin and hepatic hexokinase and lowering the hepatic glucose-6-phosphatase, serum acid phosphatase (ACP), alkaline phosphatase (ALP), and lactate dehydrogenase (LDH) in diabetic rats thus showing hypoglycemic and hypolipidaemic effect.

### **Anti-HIV effects**

*Tinospora cordifolia* extract has demonstrated a decrease in the recurrent resistance of HIV virus thus improving the therapeutic outcome. Anti-HIV effects of TCE revealed showing reduction in eosinophil count and stimulation of B lymphocytes, macrophages and polymorphonuclear leucocytes and hemoglobin percentage thus, revealing its promising role in management of the disease (Akhtar, 2010).

### ***Tinospora cordifolia*: Anti-microbial activity**

Sharma *et al.*, (2013) reported the methanol extracts of stem have potential against microbial infections. The anti-bacterial activity of *Tinospora cordifolia* extracts was assayed against *Escherichia coli*, *Staphylococcus aureus* and *Bacillus cereus* (Gram-positive bacteria), anti-fungal activity has been assayed against *A. niger*, *R. stolonifer*, *A. flavus*, *A. solani* and *F. oxisporum*.. In mice models, *Tinospora cordifolia* extracts have been reported to function in bacterial clearance and improved

phagocytic and intracellular bactericidal capacities of neutrophils (Thatte *et al.*, 1994). However, TCE has immunostimulant properties on macrophages (Sengupta *et al.*, 2011).

### **Tinospora cordifolia: Anti-oxidant activity**

The anti-oxidant capacity of *Tinospora cordifolia* stem methanol extracts administered orally increased the erythrocytes membrane lipid peroxide and catalase activity. It also decreased the activities of SOD, GPx in alloxan-induced diabetic rats (Sivakumar *et al.*, 2010). Gacche *et al.*, (2011) have reported extracts of *Tinospora cordifolia* showing possible inhibitors of aldose reductase and anti-oxidant agents, thereby reducing chemotoxicity induced by free radicals.

### **Tinospora cordifolia: Effects on other diseases**

A dose dependent reduction in lipid peroxide levels of serum and heart tissue were observed with the prior treatment of stem extract of *Tinospora cordifolia* (Rao *et al.*, 2005). The activation of macrophages by cytotoxic T cells leads to increase in GM-CSF which leads to leucocytosis and improved neutrophil function (Thatte *et al.*, 1994). Octacosanol isolated from *Tinospora cordifolia* inhibits proliferation of endothelial cells and tumor cells, inhibits neovascularization induced by angiogenic factors in chick chorioallantoic membrane and rat cornea *in vivo* angiogenesis assays and also inhibits secretion of ascites fluid in the growing tumor cells *in vivo* by inhibiting activity of matrix metalloproteinases (MMPs) and translocation of transcription factor nuclear factor-kappa-B (NF- B) to nucleus (Thippeswamy *et al.*, 2008). Oral administration of 70% methanolic extract

of *Tinospora cordifolia* stem reduces sperm motility and density, lowering of serum testosterone, protein, sialic acid, glycogen contents, and depletion of vesicular fructose of testes leading to reduction of male fertility in rats (Gupta *et al.*, 2003). The *in vivo* administration of alcoholic extract of *Tinospora cordifolia* has been reported to increase bone marrow derived macrophages (BMDM) in bearing Dalton's lymphoma (DL) (Singh *et al.*, 2006).

## References

- Akhtar, S., (2010). Use of *Tinospora cordifolia* in HIV infection. *Indian Journal Pharmacol*, Vol 42:57-59.
- Chougale, AD., Ghadyale, VA., Panaskar, SN. and Arvindekar, AU., (2009). Alpha glucosidase inhibition by stem extract of *Tinospora cordifolia*. *J Enzyme Inhib Med Chem*, Vol 24: 998-1001.
- Gacche, RN. And Dhole, NA., (2011). Profile of aldose reductase inhibition, anti-cataract and free radical scavenging activity of selected medicinal plants. An attempt to standardize the botanicals for amelioration of diabetes complications. *Journal Food Chem Toxicol*, Vol 49: 1806-1813.
- Gupta, RS. and Sharma A., (2003). Antifertility effect of *Tinospora cordifolia* (Willd.) stem extract in male rats. *Indian Journal Exp Biol*, Vol 41:885-889.
- Jahfar, M. (2003). Glycosyl composition of polysaccharide from *Tinospora cordifolia*. *Acta Pharm*, Vol 53:65-69.
- P S, Zinjarde, SS., Bhargava, SY. And Kumar, Ar., (2011). Potent alpha-amylase inhibitory activity of Indian Ayurvedic medicinal plants. *Journal BMC Complement Altern Med*, Vol 11: 51-55.

- Patel, M. and Mishra, S., (2010). Hypoglycemic activity of alkaloidal fraction of *Tinospora cordifolia*. *Journal Phytomedicine*, Vol 18: 1045-1052.
- Prince, PS., Kamalakkannan, N. and Menon, VP., (2004). Restoration of antioxidants by ethanolic *Tinospora cordifolia* in alloxan-induced diabetic Wistar rats. *Acta Pol Pharm*, Vol 61: 283-287.
- Raghu, AV., Geetha, SP., Martin, G., Balachandran, I. and Ravindran, PN., (2006). Review article of *Tinospora cordifolia*. *Journal In vitro cell. Dev. Biol.- Plant*, 42, 584-588.
- Rao., PR., Kumar, VK., Viswanath, RK. and Subbaraju, GV., (2005). Cardioprotective activity of alcoholic extract of *Tinospora cordifolia* in ischemia-reperfusion induced myocardial infarction in rats. *Journal Biol Pharm Bull*, Vol 28: 2319-2322.
- Sangeetha, Mk., Raghavendran Balaji, HR., Gayatri, V. and Vasanthi HR., (2011). *Tinospora cordifolia* attenuates oxidative stress and distorted carbohydrate metabolism in experimentally induced type 2 diabetes in rats. *J. Nat Med*, Vol 65:544-550.
- Sengupta, M., Sharma, GD. and Chakraborty, B., (2011). Effect of aqueous extract of *Tinospora cordifolia* on functions of peritoneal macrophages isolated from Carbon tetra chloride intoxicated male albino mice. *Journal BMC complement Altern Med*, Vol 11:102-104.
- Sharma, A and Batra A., (2013). *In vivo* antimicrobial activity of Indian medicinal plant *Tinospora cordifolia* using serial tube dilution technique. *Asian Journal of pharmaceutical research and development*, Vol 2: 148-156.
- Shetty, BV. And Singh, V., (1987). Flora of Rajasthan. 1<sup>st</sup> edition, Merrut publishers and distributors, Merrut, vol 1 : 756-1000.
- Singh, RP., Banerjee, S., Kumar, PV., Ravesha, KA. and Rao, AR., (2006). *Tinospora cordifolia* induces enzymes of carcinogen or drug metabolism and antioxidant system and inhibits lipid peroxidation in mice. *Journal Phytomedicine*, Vol 13: 74-84.
- Singh, SS., Pandey, SC., Srivastava, S., Gupta, VS., Patro, B. and Ghosh, AC., (2003). Phytochemistry of *Tinospora cordifolia*. *Journal Indian Pharmacology*. Vol 35: 83-91.

- Sivakumar, V. and Rajan, MS., (2010). Antioxidant effect of *Tinospora cordifolia* extract in alloxan-induced diabetic rats. *Indian Journal Pharm Sci.* Vol 72: 795-801.
- Stanely, P., Prince, M. and Menon, VP., (2000). Hypoglycemic and other related actions of *Tinospora cordifolia* roots in alloxan-induced diabetic rats. *Journal Ethnopharmacol*, Vol 70: 9-15.
- Subramanian, M., Chintalwar, GJ., and Chattopadhyay, S., (2002). Antioxidant properties of a *Tinospora cordifolia* polysaccharide against iron-mediated lipid damage and gamma-ray induced protein damage. *Journal Redox Rep.* Vol 7: 137-143.
- Sudhakaran, DS., Sreerika, P., Devasree, LD., Premsingh, S. and Michael, Rd., (2006). Immunostimulatory effect of *Tinospora cordifolia* (Miers) leaf extract in *Oreochromis mossambicus*. *Indian J. Exp. Biol*, Vol 44: 726-732.
- Thatte, UM., Rao, SG. and Dahanukar, SA., (1994). *Tinospora cordifolia* induces colony stimulating activity stimulating activity in serum. *Journal postgrad Med*, Vol 40: 202-203.
- Thippeswamy, G., Sheela, M. and Salimath BP., (2008). Octacosanol isolated from *Tinospora cordifolia* downregulates VEGF gene expression by inhibiting nuclear translocation of NF-Kappa-beta and its DNA binding activity. *EUR Journal Pharmacol*, Vol 58: 141-150.
- Umamaheshwari, S and Prince Mainzen, PS., (2007). Antihyperglycaemic effect of "Ilogen-Excel", an ayurvedic herbal formulation in streptozotocin-induced diabetes mellitus. *Acta Pol Pharm*, Vol 64:53-61.