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Pharmacognostical, Phytochemical and Pharmacological Review of *tinospora cordifolia*

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Abstract: *The Tinospora Cordifolia is important medicinal plant.The family of tinospora cordifolia is "Menispermaceae". The all part of plant is used medicinally. The are traditionally used of a common ingredient in the different Falk, Ayurvedic, Unani and Siddha medicine systems. This plant's ceremonial medicinal importance is primarily because of the root, stem, and leaf.This is due to higher alkaloid content in the stems than in the leave. Presence of wide range of chemical constituents, traditional and medicinal use in the treatment of diabetes mellitus, fever, arthritis, skin diseases and anti-inflammatory, hypoglycemic, immunomodulatory, antioxidant, anti-allergy, antipyretic, antiarthritic and various other medicinal uses . This review paper provides information regarding pharmacognostical, phytochemical and pharmacology of Tinospora cordifolia.*

Keywords: *Tinospor cordifolia,* pharmacological, phytochemicals, pharmacologycal study and Medicinal properties

I. INTRODUCTION

Botanical Name - *Tinospora cordifolia*
Common name: Giloy, Guduchi
Scientific name: *Tinospora cordifolia*
Family: Menispemaceae
Parts used: whole plant (1)

In India the medicinal plants are considered as oldest sciences where commonly used as herbal drug in history of human life, treatment of diseases with medicinal plant use for the recovery from diseases. (2) The *tinospora cordifolia* is having medicinal properties in which the phytochemical constituents in the plant give therapeutic effect. (3) It mainly consists of alkaloids, glycosides, steroids, aliphatic compounds, essential oils, mixture of fatty acid, calcium, phosphorous, protein and polysaccharides. (4) It has been recognized as mostly used plant as traditional system of medicine for its spasmolytic, allergen-free and anti-diabetic property. The plant significantly improves immune system. This plant show many useful properties. The root part of this plant use for stress relieving and antimalarial. while its stem is being used as bitter stomachic and diuretic. It stimulates biliary secretion, enrich the blood and cure jaundice. (5) Herbal medicine tends to have a greater demand as a primary health care system because of their lesser adverse effects, efficacy, safety etc. (6) In india *tinospora cordifolia* have defferannt name in different region such as.

Hindi - Gulancha
Marathi - Gulvel
Kannada - Amrutaballi, Madhuparni
Malayalam - Amrytu, Chittamritam
Bengali - Golancha
Tamil - Amudam, Chindil
Urdu - Gilo, Satgilo
Telugu - Tippateeg Guricha
Sanskrit - Guduchi, Amrita (8)

1.1 TAXONOMY

Kingdom: Plantae Plants

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Subkingdom:	Tracheophyta Vascular Plants
Super- division:	Spermatophyta Seed bearing plants
Division:	Magnoliophyta Flowering
Class:	Magnoliopsia Dicotiledons
Subclass:	Polypeptalae Petals are free
Serie:	Thalamiflorae Many stamens and flower hypogynou
Order:	Ranunculales
Family:	Menispermaceae
Trib:	Tinosporeace
Genus:	Tinospora
Species:	cordifolia (7)

Fig : plant of *Tinospora cordifolia*

1.2 Traditional Use

Traditionally *Tinospora cordifolia* use as

A) Stem

stem extract is used in the treatment of jaundice.
Stem juice taken orally with honey for treatment of asthma
Stem juice use to treat of skin diseases

B) Fruit

It treatment of rheumatism and jaundice dried fruit is taken along with ghee.
Dried fruit powder use as tonic along with ghee.

C) Stem and Root

stem and root extract is used for snake bite and scorpion sting.
Stem and root powder treatment of cancer taken along with milk

D) Leaves

It mainly used for ulcer irritation
For burning sensation
To treat ear pain (2-3 drops)

E) Root

Root paste use to treat leprosy
Root juice use For fever

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Root decoction use in treatment of dysentry

F) Whole Plant Paste

Cough treatment (9,10)

1.3 Medicinal Use

Tinospora cordifolia is used for medicinal plant as general tonic, anti-spasmodic, anti-inflammatory, antipyretic, antiarthritic, antilepritic, antiallergic and antidiabetic property. (13) The plant is used to improve the immune system and the body resistance against infections. The root of this plant is use for anti-stress and antimalarial. The stem is use diuretic, stimulates bile secretions. (11) The plant is also used in the treatment of wounds, pneumonia, asthma and cough. *Tinospora cordifolia* has anticancer, immune stimulating, nerve cell protecting, antidiabetic, cholesterol lowering and liver protective actions. *Tinospora cordifolia* is also use for decreasing the tissue damage caused by radiation, the side effects of some forms of chemotherapy. (12)

II. PHYTOCHEMICALS

STEM

ALKALOIDS

Berberine, palmatine D, choline D, tinosporine, Magnoflorine, tetrahydropalmatine, isocolumbin Palmatine , Tembetarine 18-norclerodane glycoside (2,14,15,16,17)

GLYCOSIDES

Furanoid diterpene glycoside
Tinocordiside - Syringin
Syringin-apiosylglycoside,
palmatoside C31, palmatoside F31, cordiofoliside B2, cordifoliside D2, cordifolisid
18-norclerodane glucosid, Furanoid-diterpene glucoside, Tinocordiside , Tinocordifolioside,
Cordioside, Cordifolioside A, Cordifolioside B, Cordifolioside C, Cordifolioside D, Cordifolioside E(18,19,20)

STEROIDS

Makisterone A, Giloinsterol, Ecdysterone (2)

SESQUITERPINOIDS

Tinocordifolin (2,21)

ROOT

ALKALOIDS

Choline, Tinosporine, Isocolumbin, Palmatine, Tetrahydropalmatine, Magnoflorine(2,22)

MISCELLANEOUS COMPOUNDS

Jatrorrhizine (2)

WHOLE PLANT

DITERPENOID LACTONES

Furanolactone, Clerodane derivatives (25)
Tinosporon, Tinosporides, Jateorine, Columbin(2)

ALIPHATIC COMPOUND

Octacosanol, Heptacosanol, Nonacosan-15-one (2,26)

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MISCELLANEOUS COMPOUNDS

(4-dihydroxy-3-methoxy-benzyl)-4-(4-hydroxy-3methoxy-benzyl)-tetrahydrofuran, Tinosporidine , Cordifol , Cordifelone , N-trans-feruloyl tyramine as diacetate , Giloin , Giloinin , Tinosporic acd**,** Tinosponidine, 6 cordifol, 6 Cordifelone, 6 Jatrorrhizin(2,27)

AERIAL PART

STEROIDS

b-sitosterol, d-sitosterol, g-sitosterol b-hydroxyecdysone, ecdysterone, makisterone, giloinsterol jateorine, columbin (23,24)

III. PHARMACOLOGICAL ACTIVITY

3.1 Anti-Cancer Activity

Tinospora cordifolia have anti-cancer activity, this activity is mostly seen in animal models. The *Tinospora cordifolia* having radio protective property and this plant considerably increases the weight of various tissues as well as body weight. It also protects from the gamma radiation radiated on the testes of mice. The cultured HeLa cells when exposed to different concentration of methylene chloride extracts of *Tinospora* cordifolia such as 0,5,10,25,50, and 100 µg/ml. it showed an increase in cell killing as compared to untreated cultured cell is dependent on dose.(28)The extraction of alkaloid palmatine from *Tinospora cordifolia* by using response surface methodology clearly indicate the anticancer potential in 7,12- dimethylbenz(a)anthracene induced skin cancer model in mice.(32) *Tinospora cordifolia* also possesses anti-neoplastic property.The mice when received 50% methanolic extract of *Tinospora cordifolia* for 30 day showed increase in life span and tumour size was significantly reduced as compared to control.It has significant ability in treating the brain tumor in C-6 glioma cell by decreasing the proliferation and differentiation rate as reported.(29 ,32). *Tinospora cordifolia* in combination with cyclophosphamide drug exhibits a cumulative effect in tumor inhibitory rate.(30) The anti-cancer activity of secondary metabolite such as magnoflorine, palmatine, jatrorrhizine, yangambin is isolated from *Tinospora cordifolia* were tested in different type of tumor cells and among them ‘palmatine’ and ‘yangambin’ use to treat KB cells while tinocordiside for colon cancer cell and oral cancerous cell (KB).(31) Tinospora cordifolia. So, it can be considered as a ‘safe drug’ use for the treatment cancer disease.

3.2 Anti-Diabetic Activity

Various isolated phytoconstituents from different sections of *Tinospora Cordifoliais* that are responsible for treating diabetes mellitus. Alkaloids, tannins, flavonoids, saponins, cardiac glycosides and steroids are these phytochemical. Hence, it makes possible in clinical as well as experimental study. Alkaloids from tinospora cordifolia stated to possess the effect like insulin hormone and shows insulin mediated actions. (33) The stem extract of *Tinosporacordifolia* is reported to decrease the level of blood sugar. The Palmatine, jatrorrhizine and magnoflorine are present in the isoquinoline alkaloid of stem by increasing the insulin efficiency. The insuline is secret from beta pancreatic cell and promoting various anti-diabetic pathway such as inhibiting glucose formation by increasing glycogenesis. There by decreasing the endogenous glucose. (35) Isoquinoline alkaloid 'berberin' of *Tinospora Cordifoliais* is use to treat diabetes. This decreases as effectively metformin the amount of elevated glucose. Liver metabolism is also facilitated by inhibiting FOXO1, which combines mitochondrial activity with insulin signalling during insulin resistance and metabolic syndrome. It lowers blood sugar and cholesterol levels and regulates blood pressure by activating adenosine monophosphate-activated protein kinase. (37) Leaf extracts of *Tinospora cordifolia* has also found anti-diabetic potential. (36) The root extract shows antihyperglycemic effect in induced diabetic model by decreasing its excess glucose level in urine as well as in blood to a range of normal.(34)

3.3 Immunomodulatory Activity

Tinospora cordifolia show immunomodulatory activity. The active compounds 11-hydroxymustakone, N-methyl-2-pyrrolidone, N-formylannonine, cordifolioside A, magnoflorine, tinocordiside and syringin have been reported to have potential immunomodulatory and cytototoxic impact. ethanol extract of Tinospora cordifolia changes in the concentration of antioxidant enzymes, increases in T and B cells and antibodies that play a major role in immunity

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boost. (38) *Tinosporacordifolia* extract, increases the production of different enzymes including 'myeloperoxidase' that enhances the anti-microbial action . (39) The alcoholic extract of *Tinospora cordifolia* increase the number of WBC and bone marrow cells it shows a potent immunomodulatory action.(40) A classical preparation of an aqueous extract of *Tinospora cordifolia* named as 'Ghana' in Ayurveda when tested on the edema rat model it reduced the edematogenic agents and thus has been shown to have a potent immunostimulatory effect on the immune system.(41)

3.4 Anti-Oxidant Activity

Tinospora cordifolia uses as an antioxidant in food systems and possibly as a nutraceutical in biological systems. *Tinospora cordifolia* methanolic, ethanolic and water extracts have antioxidant potential. (42)*Tinospora cordifolia* stem methanol extracts administered orally increased the erythrocytes membrane lipid peroxide and catalase activity. It also decreased the activities of superoxide dismutase, glutathione peroxidase in alloxaninduced diabetic rats. (43) Methanolic extract of leaf and ethyl acetate extract of stem shows these antioxidant activities.The stem extract has lower retention of antioxidant activity as comparing to leaf extract. The plant containing polyphenols and tanninsshow Antioxidant protective property. (44) Alcoholic extract of *Tinospora cordifolia* roots administered at a dose of 100 mg/kg. orally to diabetic rats for six weeks normalized the antioxidant status of liver and kidney. (45)

3.5 Anti-Microbial Activity

Tinospora cordifolia containg methanolic extract use against microbial infection. Anti-bacterial activity of Tinospora cordifolia extract has been checked on defferant microbs such as E-coli, Klebsiella pneumonia, Proteus vulgaris, Salmonella typhi, Shigella flexneri, Salmonella paratyphi etc.(47) *Tinospora cordifolia* showed maximum inhibitory activity against on clinical isolates of urinary pathogens Klebsiella pneumoniae and Pseudomonas aeruginosa by using Aqueous, ethanol and acetone extracts of leaves and stem of *Tinospora cordifolia*. Silver nanoparticles synthesized from stem of *Tinospora cordifolia* show very good antibacterial activity against multidrugresistant strains of Pseudomonas aeruginosa. (46) *Tinospora cordifolia* stem ethanol extract was found to be active against bacteria and fungi. (48)

3.6 Anti-HIV Activity

Root extract of *Tinospora cordifolia* show anti-HIV activity by reducing the level of leucocytes, haemoglobin and esinophil count, stimulating macrophages and B-lymphocytes.*Tinospora cordifolia* uncovers its application in managing the disease by increasing the CD4 T-cells count and decreasing eosinophil count in HIV positive patients. *Tinosporacordifolia* extract showed significantly enhanced phagocytic and intracellular bactericidal activity. *Tinospora cordifolia* also stimulated peritoneal macrophage. Furthermore, *Tinosporacordifolia* increases phagocytosis and intracellular killing property. Study concluded that guduchi having significant anti-HIV activity. (49)

3.7 Antiinflammatory activity

The stem extract of *Tinospora cordifolia* showed anti-inflammatory activity. antiinflammatory activity of *Tinospora cordifolia* methanolic extract by inhibition of COX and LOX enzyme due to the presence of alkaloids and flavanoids. Also found that LOX enzyme inhibition due to protoberberine. In future it may develop as a therapeutic agent with less side effects(50)

IV. CONCLUSION

The present review mainly focused on the pharmacological, phytochemicals, pharmacologycal study and medicinal importance and potential of Tinospora cordifolia. Present review spotlights the classical antidiabetic, anticancer, immunomodulatory, antioxidant, antimicrobial, anti-hiv,anti-inflammatory activity.

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