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A Review on Therapeutic Multipurpose Medicinal use of *Tinospora Cordifolia*

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ABSTRACT

The present review gives the information about the *Tinospora cord folia* (Gauche or Amrita) is used as medicine such as Ayurvedic, Uninai, Sridhar and Homeopathy that is also called AYUSH. *Tinospora cordifolia* is also called "Heavenly elixir". The various types of drugs subjected for number of chemicals, preclinical, pharmacological and therapeutic applications have been indicated. Various allelopathic drugs are used to cure the several diseases to increase the level of prominence of crude extract of *Tinospora cord folia*.

All the parts of *Tinospora cordifolia* plant is used as therapeutic uses, it contains phytochemicals compounds. These compounds are used in cognition, anti tumour, anti inflammatory, anti neoplastic, anti osteoporotic, antimalarial, anti hyperglycemia, anti hyper lipidemia, antioxidant, anti tuberculosis, anti angiogenic and anti allergic. It is also used to control the side effects of cancer chemotherapy, radiotherapy and in surgery. The current study presents the chemical and biological activity use in medical science and in field of research.

KEYWORDS: *Tinospora cordifolia, Phytochemicals, allelopathic drugs*

1. Introduction

Medicinal plants play very important role in world health (Sandberg F., Corrigan D., 2001). Medicinal plants is an important source of therapeutic and prophylactic purposes, it is generally used in treatment of diseases as well as maintained the good health and conditions in human being (Schlz V et al., 2001)

Tinospora cordifolia is commonly called "Guduchi" and "Gulvel". There are 40 species but 4 species found in India.It is herbaceous perennial vine that belong to the family Menispermaceae. Tinospora cordifolia is impart of youthfulness, vitality and longevity that is also called "Amritam". *Tinospora cordifolia* crude extract is generally used due to their natural components such as berberine, psilocin, vincristine and morphine (Balandrin MF etal., 1985). There is lot of modern medicines derived from natural products such as vinblastine, aspirin, quinine is derived from quinine bark that is called *Cinchona officinalis*, and digitalis is derived from *Digitalis purpurea* and paracetamol (Briskin DP., 2000).

2. Occurrence and Distribution

Tinospora cordifolia is distributed in China, Myanmar, Thailand, Srilanka, Vietnam and Africa, Australia, India and Pacific Islands (FormanLL., 1981; Mabberley DJ., 2005., Pendse et al., 1981; Singh et al., 2003; Mia et al., 2009; Jain et al., 2010). In India, *Tinospora cordifolia* is widely distributed in Himalayas to the southern part of Peninsular India. It is also lie in Bihar, West Bengal, Kerala, Karnataka, Kumaon and in Assam (Singh, J etal. 2003). It has 70 genera and 450 species. *Tinospora cord folia* is found in 500 meters altitude in temperature range of 25 to 45°C (Kokate CK etal. 2010). It is found in acid to alkaline and needs moderate soil moisture (Sharma et al., 2010 c)

3. Chemical constitution of *Tinospora cordifolia*

Tinospora cordifolia contains 11.2 percent of protein and rich in calcium and phosphorous (Khosa et al., 1971; Zhao et al., 1991). It has many aliphatic compounds and polysaccharides 1→4 linked glean (Mehra PN etal., 1969; Rao EV etal., 1981) such as alkaloids, diterpenoid, lactones, glycosides, steroids, phenolics. An arabinogalactan is also isolated from the dried stems of *Tinospora cord folia* (Chinaware G., et al., 1999). It also has high fibre i.e 15.9%, Carbohydrate is 61.66%, fat is 3.1%, potassium is 0.845%, high chromium 0.006%, Iron is 0.28% and calcium is 0.131%. Its Nutritive value is 292.54 calories per 100 gram (Nile and Khobragade. 2009). It has number of chemical constituents has number of different groups such as Alkaloids, Terpenoids, Lignans, Steroids and many other active arabinogalactan.

A. Alkaloids

Tinosporine, Magnoflorine, Tembetarine, Berberine, Choline, Palmatine, Jatrorrhizine, 1,2-Substituted pyrrolidine, Alkaloides, viz. jatrorrhizine, palmatine, berberine, tembeterine, choline, Isocolumbin, Aporphine alkaloids, Tetrahydropalmatine. These are all compounds are extract from Stem and root part of Tinospora cordiofolia. These compounds are used to cure Antiviral infections, Anticancer, Antidiabetes, nflammation, Neurological, immunomodulatory, psychiatric conditions

B. Terpenoids

Tinosporide, Furanolactone deterrence, Furanolactone clerodane diterpene, furanoid diterpene, Tinosporaside, ecdysterone makisterone and glucosides as polyacetate, phenylpropene disacchrides cordifolioside A,B and C, cordifoliside D and E, Tinocordioside, cordioside,

palmatosides C and F, Sesquiterpene glucoside tinocordifolioside, Sesquiterpene tinocordifolin, dihydroxy-2S-3R:15,16-diepoxy-cleroda-13(16),14-dieno-17,12S:18,1S-dilactone,Columbin. These all compounds are extracting from the whole part of plant (*Tinospora cordiofolia).* These extracts are used in Vasorelaxant: relaxes norepinephrine which induced contractions and inhibit the Ca++ influx from the body, it also help in anti-inflammatory, anti-microbial, antihypertensive, and act ac antiviral activities. These are the compounds also induced the apoptosis in leukemia by activate the caspase-3 and bax, and also inhibits the bcl-2.

C. Lignans

3(α, 4-dihydroxy-3—methoxybenzyl)-4-(4-hydroxy-3-methoxybenzyl)

D. Steroids

Gilinsterol, β-Sitosterol, 20α-Hydroxyecdysone,γ-sitosterol,Makisterone A, Giloinsterol are extract from s hot of plant. Which help in Ig A neuropathy, Glucocorticoid that is induced in osteoporosis in early inflammatory arthritis, It also induced in cell cycle arrest in G2/M phase and apoptosis through c-Myc suppression. It also inhibits TNF-α, IL-1β, IL-6 and COX-2.

E. Glycosides

18-norclerodane glucoside, Furanoid diterpene glucoside, Tinocordiside,Tinocordifolioside Syringin, Syringinapiosyglycoside, Pregnane glycoside, Palmatosides, Cordigolioside A,B,C,D and E are extract from stem of the plant. It treats neurological disorders like ALS, Parkinson, Dementia, motor and cognitive deficits and neuron loss in spine and hypothalamus, Immunomodulation. It inhibits NF-k Band act as nitric oxide scavenger to show anticancer activities.

F. Sesquiterpenoid

Tinocordifolin compound extract from stem of the plant that is used as antiseptic agent.

G. Alipatic Compounds

Octacosanol, Heptacosanol Nonacosan-15-one dichloromethane is extract from whole parts of plant. It has Anti-nociceptive and Antiinflammatory properties. It also helps in Protection of against 6-hydroxydopamine induced parkinsonisms in rats. It also helps to regulate the VEGF and inhibits the TFN-α from binding to DNA.

H. Others

3,(a.4-di hydroxy-3-methoxy-benzyl)-4-(4-compounds hydroxy-3- methoxy-benzyl)-tetrahydrofuran, Jatrorrhizine, Tinosporidine, Cordifol, Cordifelone, Giloinin, Giloin, N-transferuloyltyramine asdiacetate, Tinosporic acid. These compounds are extracted from the roots and whole plant. They help in Protease inhibitors for HIV and drug resistance for HIV.

4. Botanical Description

It is large woody succulent climbing shrub with elongated twining branches. Leaves are big and heart shaped 6-12 cm long and 7-12cm wide. Petioles are glabrous and 5-15cm long. Flowers are unisexual and it has two or three small yellow and greenish color flowers are fascicled. Male inflorescence is slender and has 5-10 cm long and has six green and glabrous sepals in two whorls. While female inflorescences are 2-6cm long and has one flower per node. Female flower has sepals and petals as in male. Fruits are 7-8 mm in length and has thick stalk with sub terminal scarlet or orange coloured.

5. Pharamacognostical Description

Tinospora cordifolia drug has undergone number of experiments for its various positive therapeutic abilities to wreathe the whole body parts of human being. In Rasayana and in Ayurveda it play very important role in human being life. In Thailand it is used to inhibit the growth of intestinal protozoan parasite such as *Blastocystis hominis*. It is basically used in treatment against Hiccups and prevents to make Hyperacidity and Leucorrhoea, asthma, skin disease, eye disorders, in fractures.

Stem

Stem is greyish green with smooth surfaces with swelling nodes with warty protuberances due to its circular lenticles. Dried stem outer bark is thin and papery br own to greyish in colour. It is differentiating into outer zone of thick walled brown coloured with compressed cells while inner zone is thin walled colourless and arranged in 3-7 rows of cells. Cortex has wide amount of parenchymatous zone which contains starch (Aiyer KN etal., 1963; Khosa RL etal., 1971).

Leaf

The leaves are simple, alternate and exstipulate in order. Leaf blades are ovate to roundish, chordate with smooth surfaces, while lower surface of leaves are pale coloured while upper surface is glaucous. The vascular bundle has radial rows of xylem tissue while inner side has rows of cambium and outer covering is formed of pholem tissues. The cross section of lamina has dorsiventral structure with mesophyll differentiated into palisade layer made up of columnar cells has mesophyll. Mesophyll is differentiated into palisade and spongy tissue. The palisade layer is walled with columnar cells. Starch is present in whole tissues (Raghunathan K etal., 1969). The petiole is slender in shape. It shows single layered epidermis and a wide zone of cortex with 3-4 layered of fibrous pericycle and 8-10 vascular bundles arranged in ring zone of central parenchymatous pith.

Root

The young aerial roots are threadlike, squarish like structures which grow downward and lengthening reach the ground. The mature aerial roots are fleshy in structure but the dried roots are 3-6cm in daimeter and have creamy white in colour that is odourless and bitter in taste. Starch is present in parenchymatous layer of aerial root. The starch grains are oval, elliptical in shape with concentric striations and has central hilum((Aiyer KN etal., 1963; Khosa RL etal., 1971).

Flowers

The flowers are unisexual, greenish yellow in colour. Male flowers are aggregated in form and female flowers are solitary inflorescence. Sepals are 6 in 2 series of 3 each. Outer ones are smaller than inner sepals. Flowering occurs in March and June month (Kirtikar KR etal., 1975).

Fruit

It is orange red in colour. It is ovoid, smooth, and fleshy and has thick stalk with sub terminal style scars. Fruits are developing during in winter season (Nadkarni KM., 1976).

Seed

This family is moonseed family. The seeds are curved in shape. The embryo is turned into curve shape automatically and it provides taxonomic properties.

6. Therapeutic Applications

The biologically active compounds such as alkaloids, steroids,, aliphatic compounds, and polysaccharides etc are extracted from the different parts of plant. These compounds have different biological roles in different disease conditions (Upadhyay AK. etal, 2010;Rout GR. etal,2006;Sharma U. etal,2012;Patel SS. etal,2009;Gupta R.etal.,2011; Jagetia GC. etal,2006;Patel MB etal.,2011;Ly PT etal.,2007;Karpova EA etal.,1991;Kapil A etal.,1997;Cheun S etal.,2000; Baldwin AS etal.,2001; Yang JH. etal.,2010;Zhao F et al.,2008;Kim SK etal.,2008;Haenen GR etal.,1999;Jahfar M etal.,2003; Sengupta S etal.,2009).

The Major biological property of *Tinospora cordifolia* includes:

A. Anti-toxic Effects

Tinospora cordifolia extracts reported to scavenge free radicals due to presence of antioxidant activity due to the presence of Aflatoxicosis (Gupta R etal. 2011).It protects against nephrotoxicity. It enhances the activity of Ascorbic acid, Protein activities of antioxidant enzymes in kidney. It also induced the liver damage (Sharma V., 2010).

B. Anti HIV Activities

Root extract of this plant decrease the level against HIV. This anti HIV effect to reduce in eosinophil count, stimulation of B lymphocytes, Macrophages (Kalilae MV etal. 2008; Akhtar S etal., 2010).

C. Anticancer Activities

Tinospora cordifolia extracts used in radioprotective role to increase in body weight, tissue weight to inhibit the harmful effects of sublethal gamma radiations in male Swiss albino mice. *Tinospora cordifolia* extracts rise in lipid peroxidation and decrease the level of cell viability, decrease the level of GSH S-transferase activity (Rao SK et al., 2008).Lipid peroxidation is an important related to cell death and cause the impairement of membrane function through the increase the membrane permeability and membrane protein oxidation and cell death. Polysaccharide fractions from *Tinospora cordifolia* effective in reduce the metastatic potential of melanoma cells. *Tinospora cordifolia* extracts increased the levels of pro-inflammatory cytokines, including IL-1β, IL-6,TNF-α,granulocyte monocyte-colony stimulating factor and the vascular endothelial cell growth factor to increase the level of tissue inhibitor of metalloprotease-1 in the B 16- F10 extract(Leyon PV etal.,2004). The effect of *Tinospora cordifolia* extract is better than doxorubicin treatment (Jagetia GC. etal., 1998)

D. Antimicrobial Activities

Tinospora cordifolia extracts against microbial infections (Narayana AS., 2011). It assayed against *E. coli*, *S. aureus*, *K.pneumonia*, *P.vulgaris*, *S. typhi*, *Shigella flexneri*, *S.paratyphi*, *S.typhimurium*, *P.aeruginosa*, *E.aerogene. Tinospora cordifolia* extracts against bacterial growth and improved phagocytic and intracellular bacterial capacities of neutrophils in blood (Sengupta S etal. 2009).

E. Antioxidant Activities

Tinospora cordifolia extracts increase the erythrocytes membrane lipid peroxide and catalase activities. Extracts of *Tinospora cordifolia* has free radical scavenging properties and has alpha glucosidase inhibitor. It has presence of alkaloids to protect against aflatoxin –induced nephrotoxicity (Gupta V etal. 2011).

F. Anti-inflammatory Activities

Tinospora cordifolia is induced oedema arthritis and human arthritis. The dried leaves of *Tinospora cordifolia* produced anti-inflammatory effect in acute and sub acute models of inflammation. *Tinospora cordifolia* is more effective than acetylsalicylic acid. It helps in joint inflammation (Jana et al., 1999).

G. Antidiabetic Activities

Tinospora cordifolia is used in Diabetes mellitus. It reduces the blood glucose and brain lipids. The extracts used to increase the in body weight, total haemoglobin and hepatic hexokinase. The root extract lowers hepatic glucose-6-phosphate and serum acid phosphatase, alkaline phosphatase and lactate dehydrogenase . The extract also prevents a decrease in body weight (Stanley and Menon, 2001).

H. Anti-stress Activities

Ethanol extract of *Tinospora cordifolia* exhibited the antistress activities compared with diazepam (Sarma etal., 1996).

I. Anti-ulcer Activities

Ethanolic extract of *Tinospora cordifolia* induced protective against restrain stress to induced ulcerization as compared the diazepam (Sarma etal., 1995).

Conclusion

Tinospora cordifolia is an adaptable medicinal plant. It has various types of medicinal compounds with valuable medicinal applications with their therapeutic utilities to battle with disease. TCE used in anticancer, anti diabetic, antioxidant, antimicrobial and antitoxic claims of *Tinospora cordifolia*. The *Tinospora cordifolia* extracts are used in Ayurvedic medicine for their extensive research and development work be taken by their products for their better economic and therapeutic utilization.

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