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An Overall Review on Tinospora Cordifolia

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Abstract:
T. cordifolia has been used in Ayurvedic preparations for the treatment of various ailments throughout the centuries. It is used as a rasayana to 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. In this review detailed description of the plant was given along with its medicinal properties and applications in various dosage forms.

Keywords:
Tannic Acid, Flavonoids, Anti- Diabetic Property, Anti-Inflammatory

1. Introduction

Tinospora cordifolia, which is known by the common names heart-leaved moonseed, gaduchi, and giloya, is an herbaceous vine of the family Menispermaceae, indigenous to the tropical areas of Bangladesh,India, Myanmar, and Sri Lanka. The stems of T. cordifolia are rather succulent with long filiform fleshy aerial roots from the branches. The bark is creamy white to gray, deeply left spiraily 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 seeds are curved. Fruits are fleshy and single seeded. Flowers grow during summer; and fruits, during winter. Stem of the T. cordifolia appears in varying thicknesses, ranging from 0.6 to 5 cm in diameter; young stems are green with smooth surfaces and swelling at nodes, while the older ones show a light brown surface marked with warty protuberances due to circular lenticels; transversely smoothened surface shows a radial structure with conspicuous medullary rays traversing porous tissues; tastes bitter [1,2].

T.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 in South Asia, Indonesia, Phillipians, Thailand, Myanmar, China and in Srilanka worldwide [3,4].

Tinospora cordifolia is widely distributed in India, extending from the Himalayas down to the southern part of Peninsular India. It is also found in neighbouring countries like Bangladesh, Pakistan and Srilanka. The plant is also reported from South East Asian continent such as Malaysia, Indonesia and Tamilnadu etc [5,6].

The chemical constituents of Tinospora cordifolia include alkaloids, diterpenoid lactones, steroids, glycosides aliphatic compounds, polysaccharides. Some 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, tetrahydropalmaitine, jatrorrhizine respectively [7].

The plant possesses anti-inflammatory, anti-oxidant, anti-hyperglycemic, anti-neoplastic, anti-stress, anti-dote, anti-spasmodic, anti-pyretic, antiallergic, anti-leprotic, antiinflammatory, anti-hyperlypidaemia, Immunomodulatory properties. Various parts of the plant contain immense medicinal property.It roots and stems are used in chronic diarrhoea and dysentery.The fresh juice extracted from the leaves of the plant is diuretic and it is used to treat gonnorrhoea.Medicated plant oil is effectively used to relieve pain and edemas [8].

Components of Tinospora Cordifolia [9]:

i. Tannins
ii. Flavaniods
iii. Sequiterpeniods
iv. Glycosides
v. saponins

2. Description of Tinospora Cordifolia

Tinospora cordifolia is a large, glabrous, deciduous, climbing shrub.

Stem: The stem structure is fibrous and the transverse section exhibits a yellowish wood with radially arranged wedge shaped wood bundles containing large vessels, separated by narrow medullary rays.

Leaves: The leaves are membranous & cordate in shape

Flowers: Flowers are in axillary position, 2-9cm long raceme on leaflet branches, unisexual, small and yellow in color. Male flowers are clustered and female are usually solitary. Flowers grow during the summers.

Seeds: seeds are curved.

Fruits: fruits are fleshy and single seeded. Fruits grow generally during winters.

3. Chemical Compositon

Tinospora cordifolia stems and roots consists of alkaloids which includes Berberine, Palmatine, Tembetarine, Magnoflorine, Choline, Tinosporin, Isocolumbin, Palmatine, Tetrahydropalmatine, Magnoflorine 18-norclerodane glucoside, Furanoid diterpene glucoside, Tinocordiside

Tinospora cordifolia stem consists of glycosides which includeTinocordifolioside, Cordioside, Cordifolioside A, Cordifolioside B, Syringin, Syringin-apiosylglycoside, Palmatosides C, Palmatosides F, Cordifoliside A , Cordiofoliside B, Cordifoliside C,

Cordifoliside D, Cordifoliside E Furanolactone, Clerodane derivatives, Tinosporon, Tinosporides, Jateorine, Columbin

The whole plant of tinospora cordifolia consists of Diterpeniod lactones like β – sitosterol, δ-sitosterol, 20 βHydroxy ecdysone

The stem and aerial parts of the Tinospora cordifolia consists of steroids like Ecdysterone, Makisterone A, Giloinsterol Tinocordifolin. Octacosanol, Heptacosanol and sequiterpeniods like Nonacosan-15-one

4. Tinospora Cordifolia Benefits to Treat Various Diseases [11]

i. The powder of root and stem is used along with milk for treatment of cancer.

ii. The whole plant of T.cardifolia used in scabies in swine, diarrhoea, Urinary diseases,syphilis, skin diseases, bronchitis, to promote longevity, increase body's resistance and Stimulate the immune system.

iii. The dried fruit powder mixed with ghee or honey, is used as a tonic and also in the treatment of jaundice and rheumatism.

iv. The dry stem crude extract of this plant which was poly saccharide in nature shows a poly clonal B-cell mitogen activity and Active components of stem extract enhanced the humoral response in mice.

v. The stem aqueous extract of T.cardifolia shows anti-inflammatory effect in both acute sub-acute models of inflammation.

vi. The stem of this plant regulates the blood sugar level due to the presence of alkaloids.

vii. The plant is also used in treatment of eye disorders and fractures.

5. Tinospora Cordifolia Medicinal Uses [12]

5.1. Anti-Diabetic Activities

The stem of this plant is generally used to cure diabetes by regulating level of blood glucose. It has been reported to act as anti-diabetic drug through explanatory oxidative stress, promoting insulin secretion by inhibiting gluconeogenesis and glycogenolysis. The anti-diabetic properties exhibited by this plant species are attributed due to the presence of alkaloids (Magnoflorine, Palmetine, Jatrorrhizine), tannins, cardiac glycosides, flavonoids, saponins, steroids etc.. The crude extract of stem in ethyl acetate, dichloromethane, chloroform and hexane inhibits the enzymes like salivary, amylase and glucosidase resulting increase in post-prandialglucose level and shows potential activities against Diabetes mellitus disease. The root extract of this plant has also been reported to have anti-diabetic properties which decrease the level of glycosylated haemoglobin, hydroperoxidase and vitamin E.

5.2. Immunomodulatory Activities

T. cordifolia is well known for its immunomodulatory response. This property has been well documented by scientists. A large variety of compounds which are responsible for immunomodulatory and cytotoxic effects are 11- hydroxymuskatone, N-methyle-2-pyrrolidone, Nformylannonain, cordifolioside A, magnoflorine, tinocordioside and syringin. These natural compounds have been reported to improve

the phagocytic activity of macrophages, enhancement in nitric acid production by stimulation of splenocyte and production of reactive oxygen species (ROS) in human neutrophil cells.

5.3. Anti-toxic Activities

Aqueous extract of this plant has already been reported to show scavenge activity due to the presence of antioxidant against free radicals generated during aflatoxicosis Further alkaloids such as choline, tinosporine, isocolumbin, palmetine, tetrahydropalmatine and magnoflorine from T. cordifolia showed protection against aflatoxin induced nephrotoxicity . Furthermore T. cordifolia shows protective effect by lowering the concentration of thiobarbituric acid reactive substance (TBARS) and enhancing the glutathione (GSH), ascorbic acid, protein and the activities of antioxidant enzymes viz., superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase, glutathione S-transferase (GST) and glutathione reductase (GR) in kidney. However, leaf and stem extract of T. cordifolia has been reported to show hepatoprotective effect in male albino mice against lead nitrate induced toxicity. Similarly, oral dose of plant extract prohibited the lead nitrate induced liver damage.

5.4. Anti-HIV Activities

Root extract of this plant has been shown a decrease in the regular resistance against HIV. This anti HIV effect was exposed by reduction in eosinophil count, stimulation of B lymphocytes, macrophages, and level of hemoglobin and polymorphonuclear leucocytes.

5.5. Anti-Cancer Activities

Tinospora cordifolia shows anti-cancer activity, this activity is mostly shown in animal models. Root extract of T. cordifolia has been shown radio protective role due to extensively increase in body weight, tissue weight, tubular diameter. Dichloromethane extracts of Tinospora cordifolia shows cytotoxic effects owing to lipid peroxidation and release of LDH and decline in GST. In pre-irradiating mice, root extract has widely affected radiation, induced rise in lipid peroxidation and resulted in the decline of GSH in testes. Most of the synthetic chemotherapeutic agents laid toxic side effects on the living organisms. The effect of Giloy has been reported better than doxorubicin treatment.

5.6. Anti-Microbial Activities [13]

Methanolic extract of Tinospora cordifolia has been reported against microbial infection. Antibacterial activity of T. cordifolia extract has been bio assayed against Escherichia coli, Staphylococcus aureus, Klebsiella pneumonia, Proteus vulgaris, Salmonella typhi, Shigella flexneri, Salmonella paratyphi, Salmonella typhimurium, Pseudomonas aeruginosa, Enterobacter aeruginosa, Enterobacter aerogene. Further, Tinospora cordifolia extract has been reported against bacterial growth and improved phagocytic and intracellular bacterial capacities of neutrophils in mice.

5.7. Anti-Oxidant Activities

Methanolic extract of stem of Tinospora cordifolia has been reported to anti-oxidant activity, by increasing the erythrocytes membrane lipid peroxide and catalase activity. It also decreases the activity of SOD, GPx in alloxan induced diabetic rats. Extract of Tinospora cordifolia hasbeen reported its free radical scavenging properties. Leaf

extract of Tinospora cordifolia reported to have an alpha-glucosidase inhibitor, characterized as saponarin was found to be also significant antioxidant and hydroxyl radical scavenging activity. Due to the presence of alkaloids it shows protection against aflatoxin-induced nephrotoxicity. Tinospora cordifolia aqueous extract has a radio protective activity, enhancing the survival of mice against a sub-lethal dose of gamma radiation.

5.8. Anti-Inflammatory Activity

The stem aqueous extract of Tinospora cordifolia exerted a significant anti-inflammatory effect on cotton pellet granuloma and formalin induced arthritis models. Its effect was comparable with Indomethacin. The plant produced significant anti-inflammatory effect in both acute and sub-acute models of inflammation.

6. Conclusions

Tinospora cordifolia is having several medical applications.It is used for thetreatment of Rheumatoid arthritis, Hay Fever and cancer. The plant is having antimicrobial property and anti-oxidant property. Converting the extract of the plant into dasage form may improve the bioavailability of the drug.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

Finding

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