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***Tinospora cordifolia* (Willd.) Hook. F. & Thomson - A plant with immense economic potential**

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ABSTRACT

Tinospora cordifolia (Willd.) Hook.f. & Thomson is a climbing deciduous shrub. It is found throughout tropical part of India also found in China, Bangladesh, Myanmar and Srilanka. Plant refers wide range of soil, acid to alkaline and it needs moderate moisture level. In Ayurveda, basically it is used for its general adaptogenic, rejuvenating and immunomodulatory activity. Besides of these properties plant also has many other unique medicinal properties. This paper describes the plant's medicinal aspects and chemical constituents in its different parts, this paper also provides brief information of plant bioprospecting and its launched market products.

Keywords: *Tinospora cordifolia*, adaptogenic, rejuvenating, immunomodulatory, bioprospecting.

INTRODUCTION

Trees and plants are of paramount importance for human life, not only in the present times but also in the remote past as well. The early man depended on them for his physical needs such as sources for food, shelter, clothing, medicine ornaments, tools and for spiritual needs like magic or ritualistic practices. It is quite well known that in addition to their practical and economic values, green plants are indispensable to all life forms on earth through the process of photosynthesis. Plants transform solar energy into chemical energy at the same time food is formed, which makes all life possible. A second unique and important capacity of green plants in the formation and release of oxygen as a by product of photosynthesis. The oxygen of atmosphere is absolutely essential to all forms of life on earth.

Among plants of economic importance, medicinal and aromatic plants have played a vital role in alleviating human sufferings. Plants are utilized as therapeutic agents since time immemorial in both organized (Ayurveda, Unani) and unorganized (folk, tribal, native)

forms. Uses of medicinal plants in the industrialized societies have been traced from the extraction and development of several drugs and chemotherapeutic drugs from these plants as well as form traditionally used rural herbal remedies.

Plant tissue culture, an essential component of plant biotechnology, offers novel approaches to plant production, micro propagation and conservation respectively. When plant cells and tissues are cultured *in-vitro*, they generally exhibit a very high degree and plasticity, which allows and type of tissues or organ to be initiated grown on another type. This regeneration of whole plant depends upon the concept that all plant cells are totipotent and can give the correct stimuli expresses the total genetic potential of the explants taken. The best known aspect of tissue culture is the testing of plant constituents in laboratory conditions and its application raising different types of plant species, like raising endangered plants, rare plants, germplasm storage, somatic hybridization and production of virus free plants etc. Moreover, plant regeneration by tissue culture has advantage of producing large number of plants from small pieces of tissues throughout the year irrespective of the season and in a much shorter time [1, 2]. Among the vast library of medicinal important plants *Tinospora cordifolia* (Willd.) Hook.f. & Thomson of family Menispermaceae is immensely valuable in terms of pharmacology and in chemical constituents.

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 [3].

Common Names

Latin	:	<i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thomson
English	:	Tinospora Gulancha / Indian tinospora
Sanskrit	:	Guduchi, Madhuparni, Amrita, Chinnaruha, Vatsadaani, Tantrika Kundalini and Chakralakshanika
Hindi	:	Giloya, Guduchi (Hindi)
Bengali	:	Gulancha
Telugu	:	Tippaatigo (Telugu)
Tamil	:	Shindilakodi
Marathi	:	Shindilakodi
Gujarati	:	Galo
Kannada	:	Amrita balli

Botanical Discription

Tinospora Cordifolia is a large, glabrous, deciduous, climbing shrub. 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. The bark is creamy white to grey, deeply left spirally and stem contains rosette like lenticels. The leaves are membranous and cordate in shape. Flowers are in axillary position, 2-9 cm long raceme on leaflet branches, unisexual, small and yellow in color. Male flowers are clustered and female are usually solitary. The seeds are curved. Fruits are fleshy and single seeded. Flowers grow during the summer and fruits during the winter [4].

Figure

A: The plant - *Tinospora cordifolia*
B: Plant creeping on the tree Neem
C: Leaf of the Plant

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 in South Asia, Indonesia, Philippines, Thailand, Myanmar, China and in Srilanka worldwide.

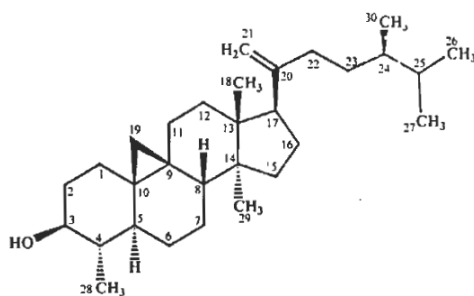
Chemical Composition

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 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 [5].

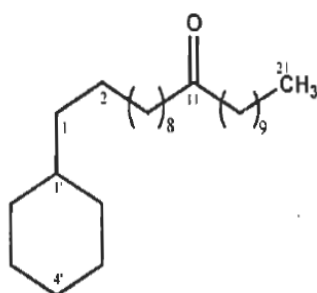
Bioprospecting Studies

Tinospora Cordifolia bioprocess have revealed three constituents they are-

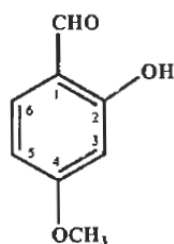
1. Cycloeuphordenol - This compound was isolated as colorless needles and formula is $C_{30}H_{50}O$ and Cycloeuphordenol belongs to diterpenoid group. By the 1H -NMR spectral data analyzing it was suggested that this compound was a known constituent previously also isolated from *Euphorbia tirucalli*.



2. Cyclohexyl-11-heneicosanone - This compound was isolated as a colorless gum and formula is $C_{27}H_{52}O$. By the 1H -NMR spectral data analyzing it was suggested that this compound was a known constituent previously also isolated from *Centella asiatica*.



3. 2-Hydroxy-4-methoxy-benzaldehyde - This compound was isolated as a needle shaped crystal and formula is $C_8H_8O_3$ and compound is a benzene derivative. By the 1H -NMR spectral data analyzing it was suggested that this compound was a known constituent previously also isolated from *Mondia Whytei*.



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, anti-hyperlipidaemia, Immunomodulatory properties. Various parts of the plant contain immense medicinal properties.

1. Stem

Tinospora Cordifolia stem is bitter, stomachic, stimulates bile secretion, enriches the blood and cures jaundice, urinary disease and upper respiratory tract infection, “Septilin” syrup, a medicinal compound containing *T. cordifolia* (7.82% in 5 ml of syrup) is a best remedy for children suffering from upper respiratory tract infections [6]. The aqueous extract of stem is useful in skin diseases [7, 8]. The root and stem extract with combination of other drugs are prescribed as an anti-dote to snake bite and scorpion sting [9, 10]. The methanol extract of *Tinospora cordifolia* has an anti-hyperglycemic property. This property is reported on streptozotocin induced diabetic male albino rats (blood glucose levels 250-400 mg/dl were taken for experiment). The treated rats had high activity of glucokinase/hexokinase (Glycolysis) and activity of glucose-6-phosphate (Gluconeogenesis) had significantly decreased. This showed that glucose level of treated rats was lowered down by the methanolic extract of plant's stem [11].

The aqueous extract of *Tinospora cordifolia* significantly lowered the serum cholesterol and moved the HDL cholesterol level to basic value. An anti-hyperlipidaemia reported on male albino rats has been seen in took three plant species- *Tinospora cordifolia*, *Cyperus rotundus* and *Embellia ribes*. But anti-hyperlipidaemia activity of *Tinospora Cordifolia* is the highest. The aqueous, methanol, methylene chloride extract of *T. cordifolia* acts as an antineoplastic agent, showing it is an anti-cancerous agent. Which gives highest activity in methylene chloride extract. It was experimented that, when exposure of *T. cordifolia* extract on Hella-cells *in-vitro* it killed the cells rapidly [12]. The dry stem crude extract of *T. cordifolia* enhanced immune responses. It increased the leucocytes and phagocytic cells [13, 14]. The dry stem crude aqueous extract of *T. cordifolia* produced significant anti-inflammatory effect in both acute and sub-acute models of inflammation. Due to inflammation pain occurs and *T. cordifolia* quenches the pain mainly in rheumatoid arthritis [15,16].

2. Bark

Dry barks of *T. cordifolia* has anti-spasmodic, anti-pyretic, anti-allergic and anti-leprotic properties [17,18,19,].

3. Root

The aqueous extract of *T. cordifolia* root has anti-oxidant property. It is successfully experimented on diabetic male albino rats [20].

Economic Products**Table1: Various valuable economic products of *Tinospora cordifolia*.**

Product name	Cure
Shila Pravang	Premature ejaculation, erectile dysfunction, to enhance the sexual stamina
Guduchi Tablets	General infections, immune disease, Hepatitis, Arthritis and anti- cancerous
Madhu Mehari	Dryness of mouth, Numbness debility, relieves Frequent urination, fatigue, Excessive thirst and maintains the blood sugar.
Safe Herbs	Anemia, vaginal discharge and also helps in sexual debility
Mussaffen	Blood purifier and skin disease.
Rebuild	Anti- stress and anti- oxidant.
Septilin	Upper respiratory tract infection
Tonplex	Increases immunity and vitality
Joint & Muscle Excellence Tablets	eliminate the toxins of joints
Natadadrol	potent muscle-building androgen

CONCLUSION

Tinospora cordifolia (Willd.) Hook.f. & Thomson commonly known as Giloy is widely used in veterinary folk medicine/ ayurvedic system of medicine for its adaptogenic and rejuvenating properties. Parts of the plant have a wide range of chemical constituents and also having pharmaceutical approach towards various ailments. The plant is used in ayurvedic, "Rasayan" to improve the immune system and the body resistance against infection. It is also believed that the plant has effective properties against Swine flu H₁N₁ virus, although researches are in progress for proving this scientifically. Due to its deep rooted qualities and its ethnomedicinal uses its demand has been increasing tremendously, therefore plant tissue culture techniques are proving as a helping hand to this. Although, its importance and immense medicinal potential is well known still it has not been explored in tissue culture much. There is a lot of scope and hope in this traditional medicinal plant- *Tinospora cordifolia*.

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