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REVIEW ON GENETIC DIVERSITY AND BIOCHEMICAL ANALYSIS OF MEDICINAL HERB: *Tinospora cordifolia*

YUGAL PRATAP SINGH[1]

Department of Botany, R.B.S. College Agra, U.P., India

ABSTRACT

Tinospora cordifolia **commonly named as "Guruche" is known for its immense application in the treatment of various diseases in the traditional ayurvedic literature. Recently the discovery of active components from the plant and their biological function in disease control has led to active interest in the plant across the globe. Our present study in this review encompasses the genetic diversity of the plant and active components isolated from the plant and their biological role in disease targeting.** ***Tinospora cordifolia*** **therapeutics such as use of crude extract of plant for the amelioration of various diseases, morphology, growth constraints, biochemical composition, biological activities, research work done, projects sanctioned to this plant species and the future prospects of this important neglected plant species for research in the field of plant tissue culture, natural products and nano-biotechnology.**

KEYWORDS: *Tinospora cordifolia,* Diversity, Biochemical, Genomic

Tinospora cordifolia commonly named as "Guruche" in Sanskrit belonging to family Menispermaceae is a genetically diverse, large, deciduous climbing shrub with greenish yellow typical flowers, found at higher altitude. In racemes or racemose panicles, the male flowers are clustered and female are solitary Chen *et al.*, (2000). The flowering season expands over summers and winters. A variety of active components derived from the plant like alkaloids, steroids, diterpenoid lactones, aliphatics, and glycosides have been isolated from the different parts of the plant body, including root, stem, and whole plant. Recently, the plant is of great interest to researchers across the globe because of its reported medicinal properties like anti-diabetic, anti-periodic, anti-spasmodic, anti-inflammatory, anti-arthritic, anti-oxidant, anti-allergic, anti-stress, anti-leprotic, anti-malarial, hepatoprotective, immunomodulatory and anti-neoplastic activities. In this review, we focus our attention to: the reported genetic diversity in the Plant biological roles reported in humans and animals and active components from the plant. Biological roles reported in humans and animals Doyle and Doyle (1987).

Medicinal plants have been used as natural medicines. This practice has been in existence since prehistoric times. There are different ways in which plants have been found useful in medicines such as crude extract of plants has been used directly because of the presence of natural chemical constituents such as berberine, morphine, psilocin, vincristine etc. and natural compounds for the synthesis of drugs such as tubocurarine, colchicine, nicotine, quinine etc. for therapeutic purpose by folk people. A large number of plants are being used in medicine for therapeutic or prophylactic purposes Kapil and Sharma (1997). The therapeutic properties of medicinal plants are attributed owing to the presence of active substances such as alkaloids, flavonoids, glycosides, vitamins, tannins, and coumarins Patel *et al.*, (2009). These natural compounds physiologically affect the body of human beings, interact with the pathogens and interrupt their growth at different stages of development and make the body disease free Parthipan *et al.*, (2011). Reports on studies of morphological and physiological characters of the plant, including plant length, stem diameter, growth habit, floral morphology, flower color, stomatal density, trichomal density, lenticels density, petiole length, plant biomass, and other characteristics of the plant and diversity in the genetic components identified by markers have indicated the diversity in the medicinal plant which has profound importance for efficient and effective management of plant genetic resources Rana *et al.*, (2012). Reports using markers for random amplified polymorphic DNA, and inter-simple sequence repeat primershave pointed toward the genetic variation within the population Sharma *et al.*, (2012) However, reports on conservation strategies and propagation of the germplasm are few Singh *et al.*, (2003).

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.*

[1]**Corresponding Author**

The Species *Tinospora cordifolia*

Tinospora Cordifolia 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.

Common Names

Latin : Tinospora cordifolia 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 Description

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.

Figure 1: *Tinospora cordifolia*

Figure 2: *Tinospora cordifolia* Leaf

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, tetrahydropalmaitine, jatrorrhizine respectively

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 ^{1}H-NMR spectral data analyzing it was suggested that this compound was a known constituent previously also isolated from *Euphorbia tirucalli*.

Cyclohexyl-11-heneicosanone

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

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-hyperlypidaemia, Immunomodulatory properties. Various parts of the plant contain immense *medicinal properties*.

CONCLUSION

Tinospora cordifolia 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 H_1N_1 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*. The study also suggests that evaluation and characterization of germplasm through both DNA as well as morphological makers validate the existence of genetic diversity among *Tinospora* populations of northwestern Himalayan region,

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