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A Review On: "Tinospora Cordifolia as a Medicinal Plant"

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ABSTRACT
Tinospora cordifolia is an Ayurvedic plant that is used to treat a variety of diseases. It is available as an annual or perennial plant. Amrita, gulbet, gurcha (hindi), Gulvel (Marathi), Amudom, Chindil are some of the more common names for this plant (Tamil). Immunomodulatory, hypoglycemic, jaundice, rheumatism, urinary disorders, anaemia, antiallergic, and anti-inflammatory characteristics have all been associated with this weed. Alkaloids, glycosides, steroids, sesquiterpenoid, aliphatic molecule, essential oils, fatty acid mixtures, and polysaccharides are the primary components of the plant. Aporphine alkaloids, clerodanediterpenes, berberine, palmatine, tembertarine, magniflorine, choline, and tinosporin are only a few of the chemical substances that have been identified from this plant. Alkaloids such as Berberine, Palmatine, Tembetarine, Magnoflorine Choline, Tinosporin, and Glycosides such as Tinocordiside, Tinocordifolioside, and others; Glycosides such as Tinocordiside, Tinocordifolioside, and others; Alkaloids such as Berberine, Palmatine, Tembetarine, Magnoflorine Choline, Tinosporin, and others The aqueous extract of these medicinal plants has been subjected to trace element research.
Keywords: Traditional plant, Herbal Drug, Ayurveda.

I. INTRODUCTION

According to the World Health Organization (WHO), up to 80% of people still rely on traditional remedies such as medicinal herbs for their medications. Plants have been employed as natural medicines since the dawn of human civilization. Scientists have recently expressed a keen interest in the development of novel medications derived from traditional medicinal herbs. India's immense biodiversity and extensive understanding of old traditional medical systems such as Ayurveda, Siddha, Unani, and Amchiand give a solid foundation for the use of a wide range of plants in general healthcare and common diseases. Tinospora cordifolia (willd) is a deciduous climbing shrub in the Menispermaceae family that belongs to the wide library of significant medicinal herbs. Menispermeaceae is a plant family that includes.

Classification

1. Guduchi is a Menispermaceae herbaceous vine that grows in deciduous and dry woodlands. The following is the botanical classification of this medicinal herb:
2. Plantae is a family of plants.
3. Magnoliophyta is a division of the plant kingdom Magnoliophyta.
4. Magnoliopsida is a phylum of the Magnoliopsidae family.
5. Ranunculales is the order.
6. Menispermaceae is a plant family.
7. Tinospora is a genus of fungi.
8. T. cordifolia is the name of the specie
9. Tinospora corifolia is a big deciduous shrub with numerous elongated twining branches that is widely spreading and climbing. The morphology of various components of shows several forms of morphology, which are discussed here.

Necessity of Growth

The plant is quite stiff and can be cultivated in virtually any temperature, however it likes a warm environment. The rainy season is the best time to plant (July to August). It requires support for growth because it is a climber. To assist its growth, fast-growing species including Neem (Azadirachtaindica), Jatropha (Jatropha curcas), and Moringa (Moringaoleifera) were planted. Tinospora cordifolia grown in conjunction with Neem (Azadirachtaindica) is known as NEEM GILOY, which has a chemical composition identical to both neem and giloy and exhibits improved medicinal qualities.

Growth Restrictions

Seeds and vegetative cuttings can be used to propagate T. cordifolia. However, both approaches are unsuitable for large-scale production and have issues with standard

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propagation methods. The main issues connected with clonal propagation include low seed viability, poor seed set, and seed germination. Vegetative cuttings are also unsuitable because of their low production and reliance on weather conditions for continued growth. Plant tissue culture techniques may be acceptable approaches for large-scale production in less time and area, given the growth limits.

Plant's Concerns

This plant has been overexploited by pharmaceutical firms and folk people for traditional cures, resulting in acute shortage to fulfil current demand. T. cordifolia has been identified by the National Medicinal Plant Board, New Delhi, as one of 29 highly prioritised medicinal plants of India's agro climatic zone 8 (Rajasthan, Uttar Pradesh, and Madhya Pradesh). NMPB, New Delhi, India has included this plant on a list of 178 medicinal plant species in high-volume trade. As a result, this plant was chosen for a review article in order to educate the public and scientific community on its morphology, growth, and other characteristics.

Seed

They are white, bean-shaped, and curved in shape. The embryo also took on a curve shape on its own

Fruits

Fruits are fleshy and have one to three seeds. These are drupelets with subterminal scars on a stout stalk. The fruit has an oval form and is scarlet or orange red in colour. During the winter, these show up.

Flowers

Flowers are tiny, unisexual, greenish yellow in colour, and are unisexual. Female flowers are solitary, whereas male blooms are grouped. Six sepals are arranged in two series of three. The outer sepals are smaller than the inner ones. Petals have six petals, are smaller than sepals, and are free and membranous. Summer (March to June) is when the flowers bloom

Leaves

This plant's leaves are membranous, simple, and alternating, with a 15-cm long petiole that is spherical, pulvinate, heart-shaped, and twisted partially and halfway around. In the beginning, the leaves are a bright green colour, but as they develop, they turn a yellowish green to yellow colour. The leaves have a harsh taste and an ambiguous odour. The lamina is ovatecordate, with a length of 10-20 cm and a width of 8-15 cm. Protein, calcium, and phosphorus are all abundant in leaves.

Root

Roots are aerial, threadlike, long filiform, threadlike, squairsh, and grow downward from mature branches or cut parts of stems, often reaching the earth by continuously growing. Aerial roots have a tetra to penta-arch basic structure, according to microscopic investigations. The cortex of the root, on the other hand, is separated into two zones: an exterior thick walled zone and an interior parenchymatous zone. The dried aerial roots have a light grey-brown or creamy white colour, are odourless, and have a bitter flavour. Starch can be found throughout the aerial root's parenchyma.

Stem

This plant has a succulent stem that is long, filiform, fleshy, and climbs. The branches produce aerial roots. The dried stem is cylindrical in shape, narrow in appearance, and somewhat twisted. The brown to grey outer bark is thin and papery. A wheel-like structure can be seen when the stem is cut transversely. Circular and conspicuous lenticels. The stem powder is a creamish brown to dark brown powder with a distinct odour and bitter flavour. Dyspepsia, fever, and urinary disorders are treated with the stem. The starch extracted from the stem, known as "Guduchi-satva," is extremely nutritious and digestive, and has been used to treat a variety of ailments

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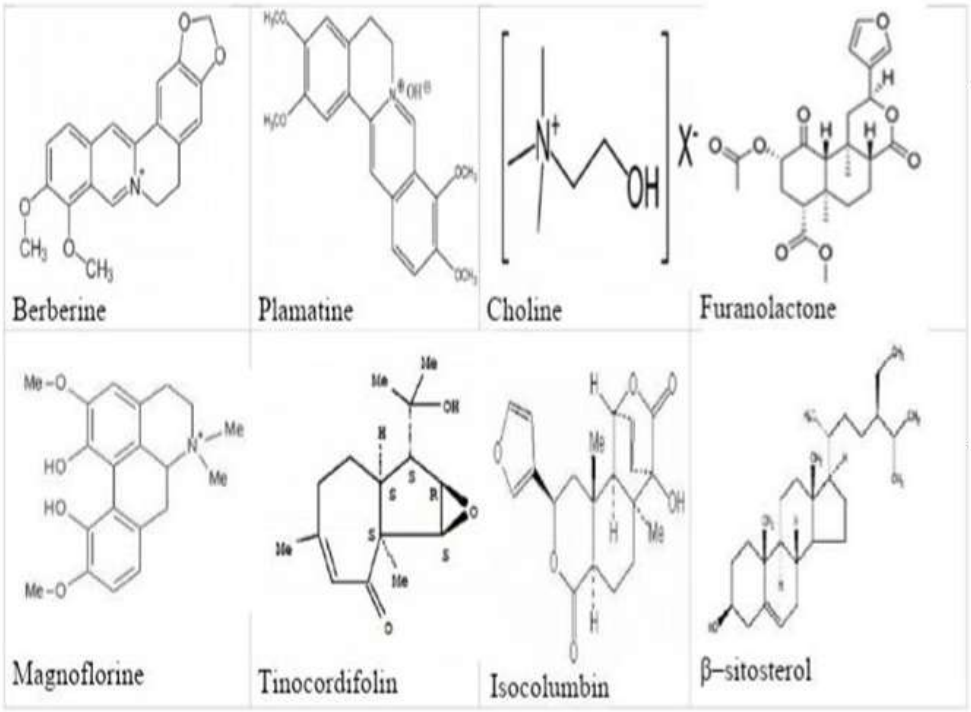
Phyoactiveconstituents

Alkaloids, steroids, terpenoids, polysaccharides, glycosides, and various aromatic and aliphatic compounds found in this plant are classified into groups such as alkaloids, steroids, terpenoids, polysaccharides, glycosides, and different aromatic and aliphatic compounds present in their phytoactive form that are responsible for a wide range of medicinal and therapeutic properties. These chemicals can be found in numerous plant sections, although they are most abundant in the stem, leaves, and root. 5 The main compounds of this plant are berberine and furanolactone, as well as tinosporone, tinosporic acid, cordifolisides A to E, giloin, gilenin, crude giloininand, arabinogalactan polysaccharide, picrotene, bergenin, gilosterol, tinosporol, tinosporidine, sitosterol.



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Class	Chemical constituents	Activity	Plant part
Alkaloids	Berberine, Magnoflorine, CholinePalmatin, Tembetarine, Tinosporine, Isocolumbin, Aporphine alkaloids, Jatrorrhizine, Tetrahydropalmatine	Anti-viral infections Neurological, Immunomodulatory anti-diabetes, Anticancer	Stem & Root
Steroids	20 δ -Hydroxyecdysone, δ-sitosterol, β –sitosterol , GiloinsterolEcdysterone, Makisterone A	Inhibits TNF-α, IL-1 β, IL-6 and COX-2. inflammatory arthritis, IgA neuropathy	Shoot
Glycosides	Tinocordiside, Tinocordifolioside, Cordioside, 18-norclerodane glucoside, CordifoliosideSyringin, Syringinapiosylglycoside, Furanoidditerpene Glucoside ,Palmatosides, Cordifolioside A, B, C, D and E, Pregnane glycoside.	anticancer activities Treats neurological disorders like ALS, Parkinsons, Dementia	Stem
Diterpenoid lactones	Furanolactone ,Tinosporon, Tinosporides , Columbin, Clerodane derivatives, Jateorine	anti-inflammatory, anti-microbial ,anti-viral. Anti hypertensive, VasorelaxantInduce apoptosis in leukemia by activating caspase-3and bax, inhibits bcl-2.	Whole plant
Sesquiterpenoid	Tinocordifolin.	Antiseptic	Stem
Aliphatic compounds	Heptacosanol, Octacosanol, Nonacosan-15-one dichloromethane.	anti-inflammatory, Protection against 6-hydroxydopamineinduced parkinsonisms in rats	Whole plant
Miscellaneous compound:	3,(α,4-di hydroxyl-3-methoxy-benzyl)-4-(4- Compounds hydroxyl-3-methoxy-benzyl)-tetrahydrofuran ,Giloinin, Tinosporic acid, Tinosporidine, Cordifol, Cordifelone, Jatrorrhizine, N-trans-feruloyltyramine as diacetate.	Protease inhibitors for HIV and drug resistant HIV.	Whole plant & Root

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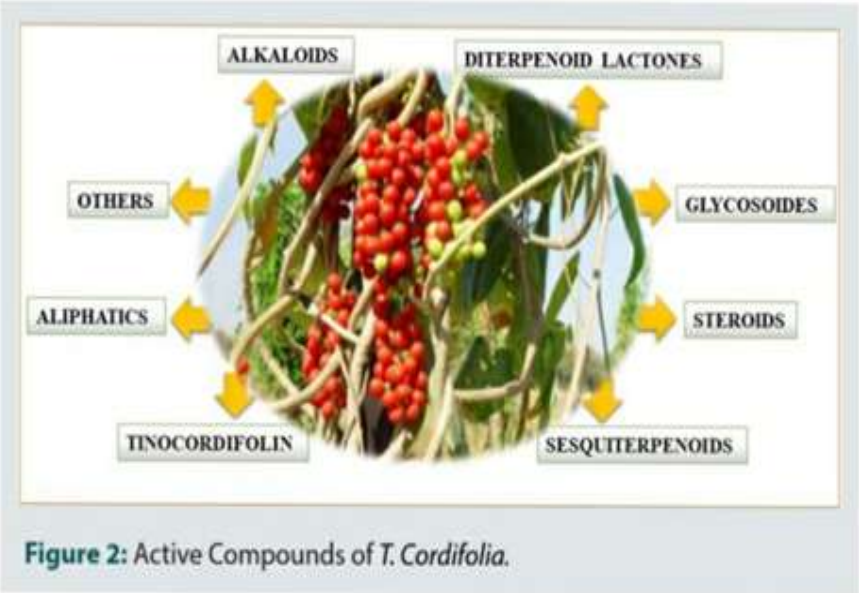

Figure 2: Active Compounds of *T. Cordifolia.*

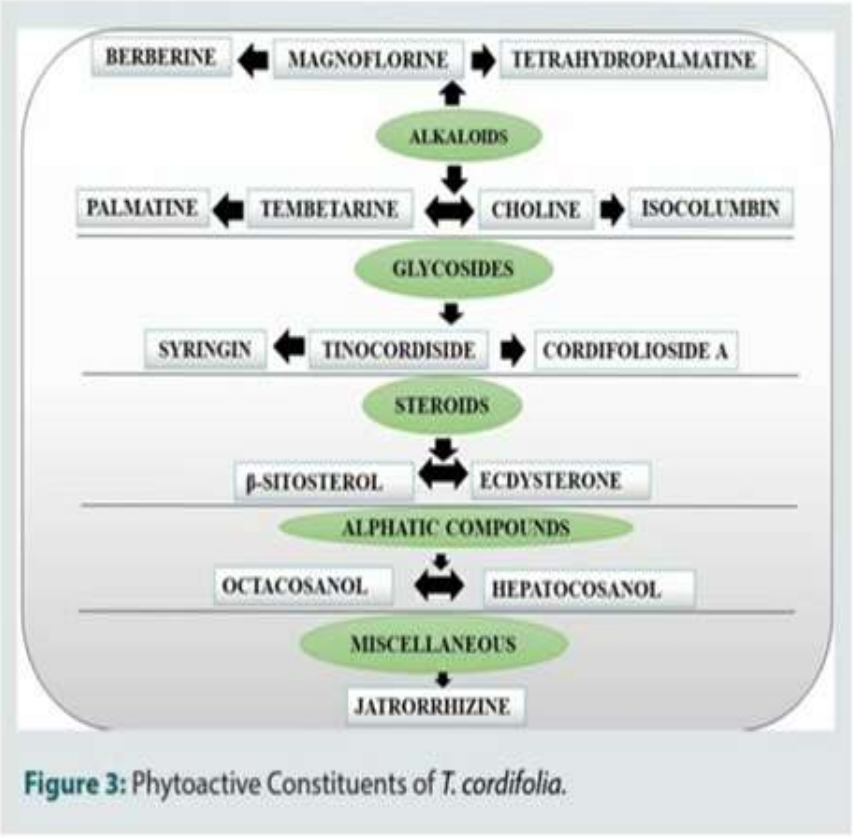

Figure 3: Phytoactive Constituents of *T. cordifolia.*

Microscopic study

Tinospora cordifolia powder a-b, Reticulate secondary wall thickening in a vessel, (Scale bar= 10m) c-Tracheidialfibre, d-Tracheids, e-f, Stone cells, g-Starch grains, h-fibres Starch, tannins, oil, mucilage, and lignin are examples of secondary metabolites. T. cordifolia powdered leaf, stem, and aerial root were subjected to physicochemical analysis, including ash and extractive values, which can be used to verify the identity, purity, and strength of the plant. For leaf, stem, and aerial root, total moisture content ranges

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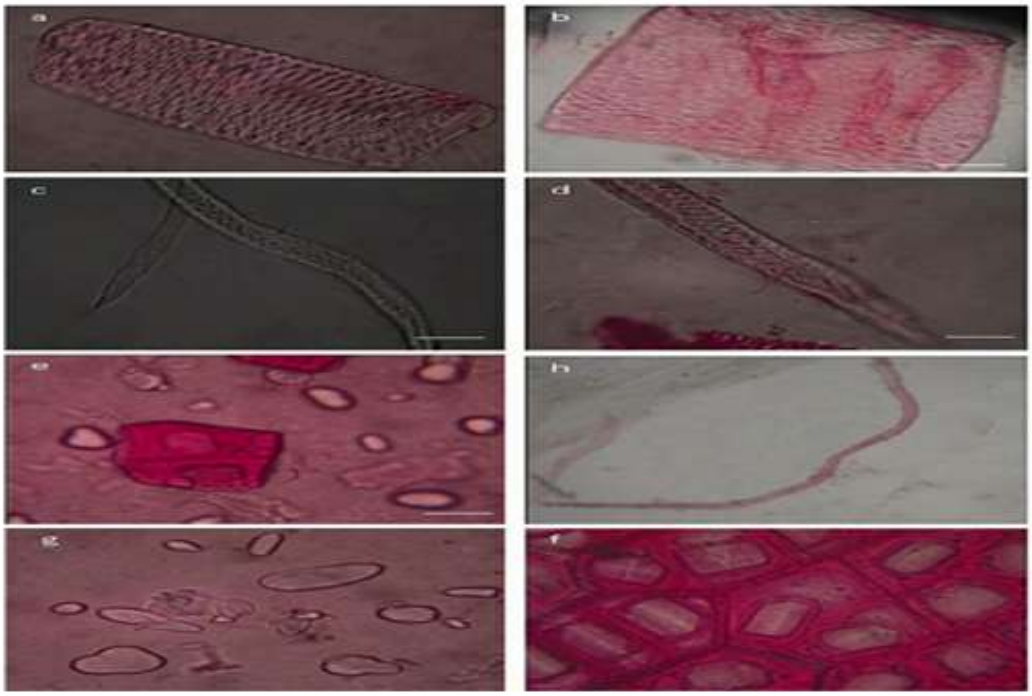
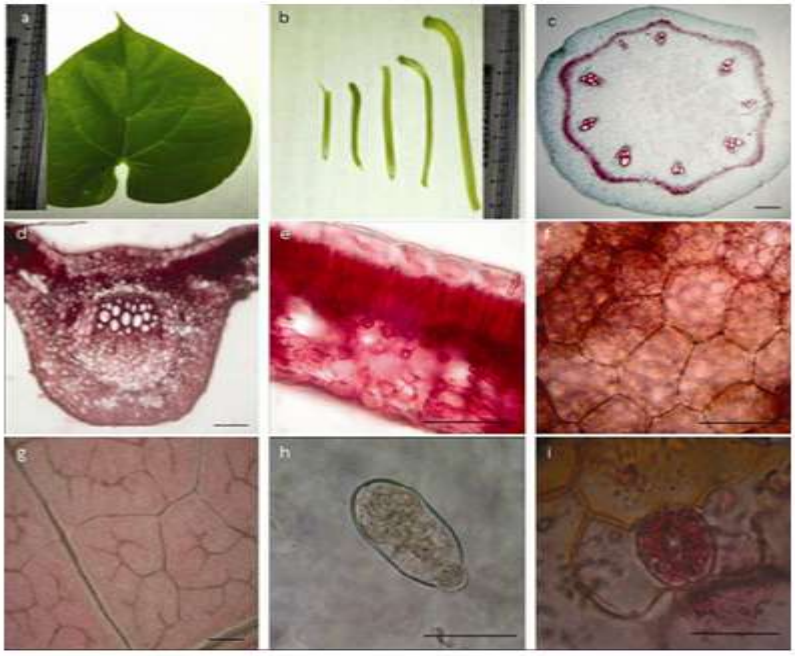
from 1.23-6.01 percent, 1.18-5.02 percent, and 1.11-4.86 percent w/w, respectively. The total ash content ranges from 1.11 to 8.02 percent, 3.02 to 10.5%, and 3.02 to 10.5 percent.



Macro scopic study

Tinospora cordifolia leaf under macro-microscopy. a-Morphology of the leaf, b-Morphology of the petiole, c-TS of the petiole, d-TS of the leaf passing through the midrib region, e-TS of the leaf passing through the laminar region, f-Epidermal cells and palisade cells in the surface view, g-Venation pattern of the leaf in the surface view, h-Unicellular trichome, i-S (Scale bar = 10 metres)



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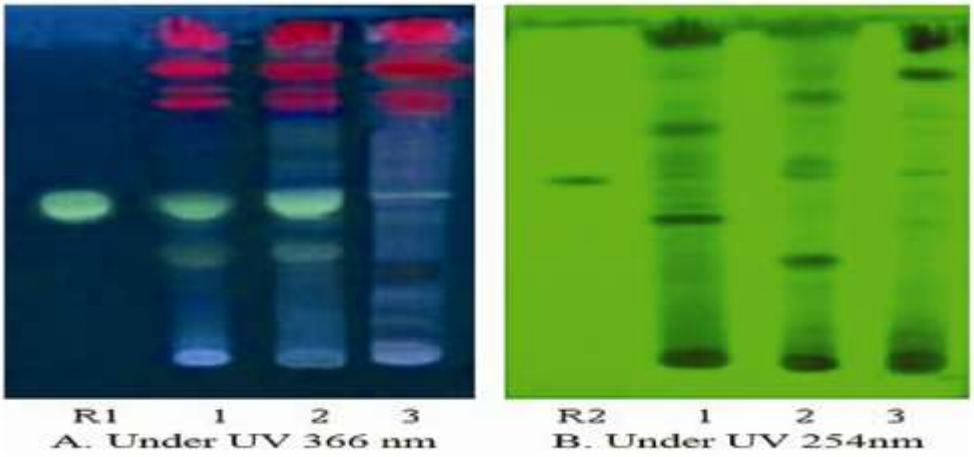
Tlc And Biomarker

Biomarkers and TLC finger print profile of methanolic extracts of various sections of Tinospora cordifolia 1-Aerial roots, 2-Stem, 3-Leaf, R1-Reference Berberine, R2-Reference Tinosporaside, R1-Reference Berberine, R2-Reference Tinosporaside, R1-Reference Berberine, R2-Reference



Medicinal Application

Tinospora cordifolia is widely used in traditional ayurvedic medicine in India due to its biological activities, which include anti-inflammatory, immunomodulatory, anti-oxidant, anti-diabetic, anti-periodic, anti-spasmodic, anti-neoplastic, anti-stress, anti-leprotic, anti-malarial, hepato-protective, anti-allergic, anti-arthritic, and anti-arthritic Fevers, asthma, diabetes, dyspepsia, jaundice, urinary issues, skin illnesses, and chronic diarrhoea and dysentery are all conditions

II. DISCUSSION

It's also used to treat heart problems, leprosy, helminthiasis. Tinospora cordifolia has long been used in traditional Ayurvedic medicine to treat fevers, jaundice, chronic diarrhoea, cancer, dysentery, bone fractures, pain, asthuma, skin illness, deadly bug bites, and eye diseases. Tinospora cordifolia extract has recently been studied for its components and biological functions. Such properties could be used to create novel formulations that are more promising and better than existing ones. Despite the fact that Tinospora is genetically varied and there have been reports of tissue culture-based propagation, viable germplasm conservation measures for such an economically important medicinal plant with several biological functions have yet to be developed.

Ayurvedic Aspects And History

Ayurveda, a 5,000-year-old medical system, defines three elemental substances: Kapha, Vata, and Pitta, which are based on Indian writings known as e Vedas. According to Ayurvedic texts such as AshtangHridaya and Sushrut, Charak, and other treatises such as Bhava Prakash and DhanvantriNighantu, T. cordifolia is known as Amara, Amritvalli, Chinmarrhuha, Chinnodebha, and Vatsadani, among others, and is most commonly known as Guduchi or Amrita.It is historically claimed for the treatment of Svasa (asthma), MahaJvara (fever), Aruci (anorexia), and kustha in the Sushurta Samhita, under Tikta-SakaVarga (leprosy). There is also a lot of evidence for treating disorders like Jvara (fever), Vat Rakta (gout), and Kamala in the context of AshtangHridaya and Charak Samhita (jaundice). It is Bhavya Prakash in Bhavya Prakash in Bhavya Prakash in Bhavy.

Tinospora cordifolia pests and diseases

The medicinal, therapeutic, curative, healing, and alleviating properties of the Tinospora cordifolia plant had been widely recognised. Though the plant has a good defense against microbes, pests, and insects, it is not invulnerable and will be impacted by a variety of diseases, one of which is highlighted here. The new flat stem disease infects the branches and the infected plant bears small leaves. It was observed that the same nodal region bears multiple new leaves ranging from 20 to 30 in number, and the older leaves are fewer in number.

Material and Method

Guduchi plants, both male and female types, strewn across Nimba

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(Azadirachtaindica).Between the dates of 05/02/2015 and 06/02/2015, trees were taken from non-polluted, wild areas near the campus of AbhilashiAyurvedic college and research institute, Abhilashi University, district Mandi, Himachal Pradesh. The plants were authenticated by the appropriate authorities in the same institute's Pharmacognosy laboratory after collecting, and the voucher specimen was retained for reference. Identification and authenticity assistance was obtained from a variety of government databases and floras. lists a few morphologically distinguishing characteristics found in the stems of male and female plants.

Table 1: Comparative morphological /organoleptic characters of male and female stem

Characters	Male plant stem	Female plant stem
General Appearance	Succulent, ridged, studded with warty tubercles as a result of the development of vertical and longitudinal rows of lenticels, with characteristic three beaked nodal swellings	Similar characters as that of male one but more succulent and less flaky in nature.
Shape	Slender, dextrorotatory twinned	Similar
Size (2 years mature plant)	1.38-2.06 cm	1.74-2.32 cm
Surface	Jagged due to longitudinal fissures of cracks along the rows of lenticels	Similar
Mucilage content on cut surface	Less	More
Pith proportion of cut surface (Pith α 1/age)	More than half in young plants	Comparatively larger pith area
Touch	Rough	Similar
Colour (of outer exfoliating bark)	Light-grey to Creamish-white	Dark green to Creamish-white
Odour	Not specific but characteristic bitter smell after removal of exfoliating outer bark	Comparatively strong
Taste	Bitter (+++)	Bitter (++)

Growth Requirements

Demands for Growth The plant is quite stiff and can be cultivated in virtually any temperature, however it favours a warm environment. The rainy season is the best time to plant (July to August). It requires support for growth because it is a climber. To assist its growth, fast-growing species including Neem (Azadirachtaindica), Jatropha (Jatropha curcas), and Moringa (Moringaoleifera) were planted. NEEM is the combination of Tinospora cordifolia and Azadirachtaindica. GILOY is chemically identical to neem and giloy, however it has better medicinal qualities. The cultivation of T. cordifolia requires medium black or red soil. Giloy can be grown in a wide range of soils, from sandy to clay loam, with success.

Natural Ingredients: Alkaloids, diterpenoid lactones, steroids, glycosides, aliphatic chemicals, and polysaccharides have all been found in various areas of Tinospora cordifolia. Table 1 lists several natural products (active chemicals) extracted from various plant parts, along with their biological functions, for the benefit of readers.

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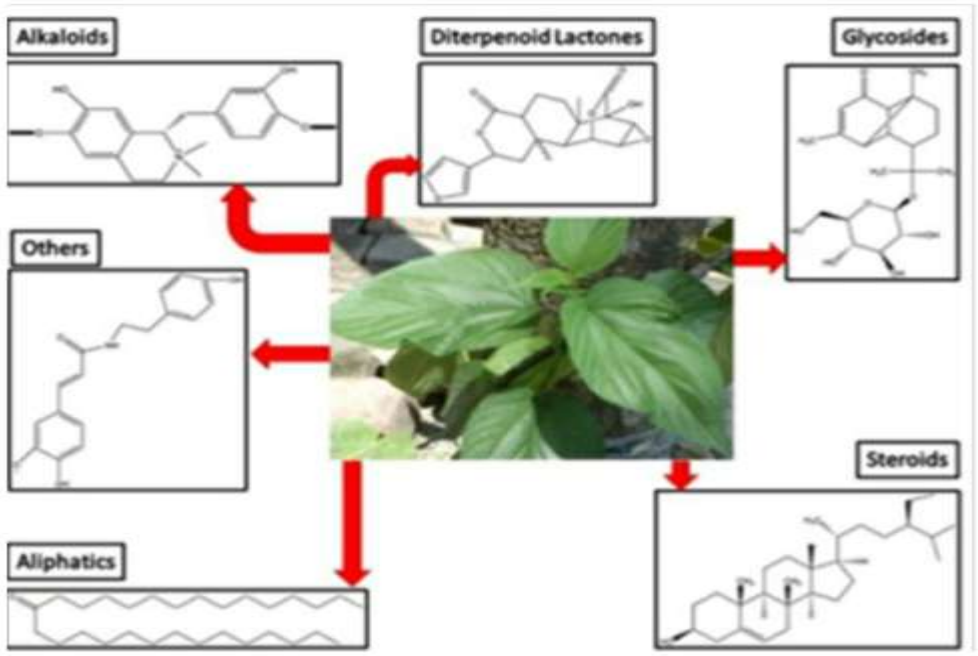

Analytical Study

Analytical Study of the data Using various analytical parameters, both fresh and dry forms of Guduchi stem from both genders were studied. Physicochemical analysis, such as loss on drying at 1100C,19 ash value,20 acid insoluble ash,21 sulphated ash, pH value,22 and various extractive values (water soluble,23 methanol soluble,24 Chloroform soluble, Benzene soluble, Diethyl ether soluble25) were performed. Quantitative assessments of total alkaloids, total starch contents29, and mucilage contents were also performed on the samples. Results Both plants tasted bitter when tested organoleptically, with the male variant having slightly higher bitterness. Fresh and dried samples of both types have had their physicochemical data examined.

S. No.	Parameters	Male stem	Female stem
1	Loss on drying at 110°C (%w/w)	71.2	75.8
2	Ash value (%w/w)	1.69	1.74
3	Acid insoluble ash (%w/w)	1.78	1.91
4	Sulphated ash (%w/w)	3.87	4.05
5	Water soluble extractive (%w/w)	7.31	7.06
6	Alcohol soluble extractive (%w/w)	14.30	14.05

Bioactivity

Tinospora cordifolia has been discovered to have strong anti-diabetic, hypolipidemic, immunomodulatory, antimutagenic/anticarcinogenic, and other actions.

Anti-dibeticActivity

The aq. On steptozotocin-induced diabetic mice, an extract of Tinospora cordifolia was studied. The goal of the study was to see how daily aq feeding affected the animals. The effects of a 40-day dose of Tinospora cordifolia extract on blood glucose levels and renal function in diabetic mice caused by steptozotocin. Over a 40-day period, plasma glucose levels, body weight, urine volume, and urinary albumin levels were measured every tenth day, with plasma creatinine levels measured at the start and end of the trial. The ratio

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of kidney weight to total body weight was used to measure renal hypertrophy. The treatment of Tinospora cordifolia extract lowerplasma glucose levels in STZ- diabetic mice. Diabetic control had much larger urine volume, and therapy prevented polyuria.

Anti- Cancer activity

Tinospora cordifolia has anti-cancer properties, which have largely been demonstrated in animal models. The anticancer potential of the alkaloid palmatine extracted from Tinospora cordifolia utilizing response surface methodology (RSM) in a 7,12-dimethylbenz(a)anthracene DMBA caused skin cancer model in mice. A single application of Tinospora cordifolia extract at doses of 200, 400, and 600 mg/kg dry weight, given 24 hours before the i.p. administration of cyclophosphamide (at 50 mg/kg), significantly reduced the formation of micronuclei in the bone marrow of mice. When C57 Bl mice were given a 50 percent methanolic extract of Tinospora cordifolia at a dose of 750 mg/kg body weight for 30 days, their life span was extended and tumour size was significantly reduced compared to control mice .

Anti-Oxidant Activity

Tinospora cordifolia could be used as an antioxidant in foods and possibly as a nutraceutical in biological systems. Tinospora cordifolia extracts in methanolic, ethanolic, and water revealed substantial antioxidant capability when compared to other solvents, as well as metal chelation and reducing power. According to the findings of the V Sivakumar et al study, Tinospora cordifolia stem methanol extracts given orally boosted erythrocyte membrane lipid peroxide and catalase activity. In alloxan-induced diabetic rats, it also reduced the activity of superoxide dismutase and glutathione peroxidase. Tinospora cordifolia can scavenge free radicals produced by aflatoxicosis. The presence of alkaloids such as choline, tinosporin, isocolumbin, palmatine, tetrahydropalmatine, and magnoflorine in Tinospora cordifolia provided protection against aflatoxin-induced nephrotoxicity.

Anti-HIV Initiatives

This plant's root extract has been demonstrated to reduce HIV resistance.
Reduced eosinophil count, activation of B lymphocytes, macrophages, haemoglobin level, and polymorphonuclear leucocytes all revealed this anti-HIV impact.

Trace element studies

Tinospora cordifolia has been used as a medicinal plant in India for centuries to treat ailments ranging from common colds, skin diseases, and dental infections to major illnesses such as diabetes, hypertension, jaundice, and rheumatism. Trace element studies on the aqueous extract of these medicinal plants were carried out using the Asian Journal of Biochemical and Pharmaceutical Research Issue 4 (Vol. 1) 2011 311 particle-induced X-ray emission technique to better understand and correlate their medicinal use. Cl, K, Ca, Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, Br, and Sr were identified and characterised using a 2-MeV proton beam. The leaf samples had extremely high concentrations of Cl, K, and Ca, as well as noticeable levels of Mn and a high Zn content.

Safety aspect

The dosage form mentioned, the drug has generally been thought to be safe.

III. CONCLUSION

Tinospora cordifolia, a versatile medicinal plant, is a one-of-a-kind source of a wide range of chemicals with various chemical structures. Because very little research has been done on the biological activity and potential medical applications of these chemicals, further research is required to fully explore their therapeutic potential in the fight against disease. To generate modern medications with the chemicals identified from Tinospora cordifolia, a drug-development programme should be launched. The current review focuses on Tinospora cordifolia's traditional antidiabetic, anticancer, immunomodulatory, antioxidant, antibacterial, and antitoxic claims, as well as their validation by recent studies. There has been a rising trend and awareness in medicinal plant research in recent years. Over the last few decades, a large amount of study has been conducted in order to better understand the chemistry.

IV. ACKNOWLEDGEMENT:

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