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Evaluation and Formulation of Gilloy Tablet (Tinospora Cordifolia)

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ABSTRACT
Tinosporacordifolia(Giloy) isa medicinal herb used in the Indian Ayurvedic system of medicine due to their health benefits. Giloy is often called 'amruta', or the 'nectar of immortality'. It isspecifically known to strengthen the immune system and keep diseases at bay. It can also help deal with other medical issues like diabetes and anxiety. The studyincludes limitations,evaluation of solid oral dosage form (tablet) from plant extract.Extractionprocedures involve use of plant materials like leaf, stem, root and flowers. Many a times samples obtained from single plant are insufficient for the extraction of primary andsecondary metabolites. For thisreason, samples are taken from randomly selected plants which are used for extraction process.

I. INTRODUCTION

TinosporaCordifoliais a climbing shrub belongs to familyMenispermaceae. It is commonly known as Guduchi, Amrita,Gurach, Tinospora. It is a large, glabrous deciduousclimbing shrub. The

stems are rather succulent with longfiliform fleshy aerial roots form the branches. The bark isgray brown and watery. The leaves are membranous andcordate. The flowers small and greenish yellow. This herbisfound throughout tropical asia ascending to a height of300 mts.

Tinosporacordifoliaalso called Amrita, Giloy, Guduchiis widely used in Ayurvedic system of medicine"Rasayanas" to the immune system and the bodyresistance against infections [1]. It is a large, glabrousdeciduous climbing shrub belonging to familyMenispermaceae is widely used in folk and Ayurvedicsystem of medicine it is referred as one of the mostversatilerejuvenatingherb.The species is widelydistributed in India, Malaysia, Indonesia and Thailand.The Hindi name of the plant is Giloy,a Hindu mythological term that cites to heavenly elixirused by Celestial beings to stay off the aging and tostay young forever [2]. The stem of T. cordifoliaissucculent with long filiform fleshy aerial roots fromthe branches. The bark is creamy white to grey, deeplyleft rosette like lenticels. The large numbers ofcompounds have been isolated from the aerial partsand roots of T. cordifolia. Flowers are yellow, growingin clusters from nodes. Fruits are drupes, turning redwhen ripe [3]. A variety of constituents have beenisolated from different parts which includes berberin,tinosporaside, tinosporin, tinocordifolioside,cordifolioside A, cordifolioside B, isocolumbin,magnoflorine. It shows the presence of terpenoids,alkaloids, lignan, carbohydrates, bitters, steroids andglycosides. Different constituents like glycoside –giloin and a non-glucoside – gilenin and gilosterolhave been found. The alkaloid tinosporin, tinosporicacid and tinosporol have been identified in the leaves.Tinosporidine and sitosterol isolated from stem,cordifol, heptacosanol and octacosonalleaves anew furanoidditerpene – tinosporide isolated from stems [4]. One of the most important constituent present in stem of T. cordifoliais berberin, anisoqunoline alkaloid having molecular formula C20H18NO4 with molecular mass 336.36122 g/mol. It isyellowcoloured alkaloid which shows strong yellowfluorescence under U.V light. It shows various pharmacological actions which enhances thetherapeutic efficacy of this plant.problems [5]. T. cordifoliaamedicinal herb used in the Indian system of medicine due to their health benefits.In modern medicine it is used for the treatment ofgeneral weakness, fever, dyspepsia,dysentery,gonorrhoea, urinary diseases, viral hepatitis andanaemia more recently the immunomodulatoryproperties, antioxidant activity, antineoplastic activity,hypoglycemic activity, antipyretic ahepatoprotective activity, diuretic, anti-stress,antihyperglycemic, antidiabetic and anti tuberculoticactivity were evaluated [6]. Hence regarding this solidoral dosage form of tablet is prepared with improvedpreformulation and formulation parameters whichprove to be useful as an antioxidant as well asantibacterial activity.

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Figure 1 – Giloy plant

MORPHOLOGICAL DESCRIPTION

It is a large deciduous, extensively spreading climbing shrub with several coiled branches with a different typeof morphology. Stem of the plant is filiform, fleshy and climbing in nature; bark is white - gray. Powder of thestem is creamish brown or dark brown, characteristic odor, bitter taste and is used in dyspepsia, fever, andurinary diseases. The starch made from the stem known as "Guduchi-satva." It is extremely nutritive anddigestive. Leaves of this plant are alternate, simple, long-petioled (approximately 15 cm); round, pulvinate,twisted, heart- shape partially and halfway around. Lamina is ovate, 10–20 cm long, seven nerved and deeplycordate at the base and membranous. Flowers are unisexual, axillary position, 2–9 cm long leaflet branches andgreenish-yellow in colour, male flowers are clustered, female usually solitary. Its fruits are single-seeded, fruitsduring the winter and flowers grow at the time of summer. The root is thread-like, aerial, squairshin, sometimescontinuously lengthening touch the ground, aerial roots are characterized by tetra to penta arch primarystructure. The seeds are curved shape, and endocarp is variously ornamented, which provide critical taxonomiccharacters.

- Gurcha is a gregarious glabrous, twiner.
- Older stems are up to 2 cm in diameter and have corky bark.
- Aerial roots arise from nodal scars of branches.
- Stem and branches are specked with white vertical lenticels.
- Bark is grey-brown or creamy white, warty, papery thin, and peels off easily.
- Leaves are 5–15 cm, ovate, and acute.
- They are membranous when young but become more or less leathery with age.

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Pharmacognosy of TinosporaCordifolia

1. Stems - Fleshy

2. Roots - long thread like, aerial, arise from branches.

3. Bark - Thin, greyish or creamy white in colour, when peeled fleshy stem is exposed.

4. Leaves - Cordate (heart shaped), membranous, juicy.

5. Flowers - Bloom during summer

a. Male flower - Small, yellow or green coloured occur in clusters.

b. Female flower - Occur singly.

6. Fruits - Pea shaped, fleshy, shiny turn red when boiled.
Occur in winter

7. Seeds - curved, pea sized.

8. Parts Used: Stems, Roots

a) leaves

b) stem

c) flower

d) fruit

9. Distribution: The plant occurs throughout tropicalregions of India extending from Kumaon to Assam andMyanmar, Bihar, Konkan to Sri Lanka. It is a largeclimber which grows over the highest trees in theforests and throws out aerial roots which reach thelength of 10 metres, though not thicker than packthread.1Sardar Bhagwan Singh PG Institute of Biomedical Sciences and Research,Balawala, Dehradun, Uttarakhand, India.

10.Cultivation: Soil And Climate: It grows well in almost any type of soils and under varying climatic conditions.

11.Nursery raising and planting: The plant is cultivatedby stem cutting in the month of May-June. It requiressome support preferably Neem and Mango trees, suchplants are supposed to possess better medicinal values.

12.Weeding and Hoeing: Periodical hoeing is done, both in the nursery and field as per requirement.

13.Manures, Fertilisers and Pesticides: The medicinalplants have to be grown without chemical fertilizers anduse of pesticides. Organic manures like, Farm YardManure (FYM), Vermi-Compost, Green Manure etc. maybe used as per requirement of the species. To preventdiseases, bio-pesticides could be prepared (either singleor mixture) from Neem (kernel, seeds & leaves),Chitrakmool, Dhatura, Cow's urine etc.

14.Irrigation: The field after plantation should be irrigated periodically as and when required

15. Weekly or fortnightly.

16.Harvesting/Post Harvesting Operation: Maturplants are collected, cut into small pieces and dried inshad.

17.Yield: Approximately 8-10 q./ha.

18.Economics: The rate for a kg. of dried stem ranges from

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19.Chemical Constituents: The plant mainly containsalkaloids, glycosides, steroids, sesquiterpenoid,aliphatic compound, essential oils, mixture of fatty acidsand polysaccharides. The alkaloids include berberine,bittergilonin, non-glycoside giloningilosterol. [2] Themajor phytoconstituent in Tinosporacordifoliaincludetinosporine, tinosporide, tinosporaside,cordifolide,cordifol, heptacosanol, clerodanefuranoditerpene,diterpenoidfuranolactone tinosporidine, columbin andb-sitosterol. Berberine, Palmatine, Tembertarine,Magniflorine, Choline, and Tinosporin are reported fromits stem. The chemical constituents of giloy belong to different classes such as glycosides, steroids, polysaccharides,phenolics, aliphatic compounds, alkaloids leaves are rich in protein (11.2%), calcium and phosphorus. Stem androot part of T. cordifolia contain alkaloids as active constituents. These are tembetarine, magnoflorine,tinosporin, isocolumbin, jatrorrhizine, berberine, aporphine alkaloids, choline, tetrahydropalmatine, palmetinewhich showed anti-cancer, anti-viral, antiinflammatory, anti-diabetes, immunomodulatory and anti-psychiatricaction .Additionally, whole plant of T. cordifolia include furanolactone, Lactones, diterpenoid, Cleodranederivatives [(5R, 10R)-4R-8R-dihydroxy-cleroda-13(16), 14-dieno-17, 12S:18, 1S-dilactone], columbintinosporides, jateorine, tinosporin. They contain biological actions such as antiinflammatory, Vasorelaxant,anti-microbial, anti-viral and anti-hypertensive. Shoot part of T. cordifolia contains Steroids (B-sitosterol,Makisterone A, δ-sitosterol, giloinsterol, 20 β-hydroxyecdysone, Ecdysterone). They are effective inglucocorticoid induced osteoporosis in early inflammatory arthritis. They tempt cell cycle arrest in G2/M phaseand inhibits TNF-α, IL-1 β, IL-6 and COX-2 and apoptosis through c-Myc suppression.Stem of T. cordifolia contain Glycosides. Their active constituents are 18-norcleodrane glucoside,Tinocordifolioside, , cordifolioside A, B, C, D and E, Furanoidditerpine glucoside, Cordioside, Syringin,pregnane glycoside Syringing-apiosylglycoside, palmatosides. They showed immunomodulation in Parkinson'sdisease, dementia, motor and cognitive disorder, neurological disorders like ALS. They inhibit NF-k Band toshow anti-cancer properties.35-41 Whole plant of T. cordifolia contain aliphatic compounds. The activeconstituents are Octacosanol, Nanocosan15-one dichloromethane, Heptacosanol. They showed anti- nociceptiveand anti-inflammatory activity. They also inhibit TNF-α from binding to the DNA and provide protectionagainst 6-hydroxydopamine induced Parkinsonism in rats. Stem part of T. cordifolia contain Sesquiterpenoidsand Tinocordifolin which exhibits an antiseptic activity The other parts of T. cordifolia contain activeconstituents such as Jatrorrhizine, Tinosporic acid, 3, (a, 4-di hydroxy-3-methoxy-benzyl)-4-(4- hydroxy-3-methoxy-benzyl) tetrahydrofuran, N-trans-feruloyltyramine as diacetate, Giloin. They showed a protective effectagainst HIV (human immunodeficiency virus). The chief Phytoconstituents of T. cordifolia are diterpenoidfurano lactone, cordifolide, cordifol, heptacosanol, tinosporide, β-sitosterol, tinosporine, clerodanefuranoditerpine, tinosporaside, and columbinrespectivel. Alkaloids such as magniflorine, Berberine, palmatine, nonglycosidegiloningilosterol, tembertarine, choline and tinosporin has been reported from the stem part of the T.Cordifolia [3-6]

Pharmacological Activities of TinosporaCordifolia In ayurvedic medicine, giloy is having a very good impact inreproductive system, blood and fat. Although it has beenused to treat a variety of conditions, from gout to jaundiceto tuberculosis, only a few of these uses are currentlysupported by scientific evidence.

1.Inhibitory Effect of a Polysaccharide on Metastasis

Administration of the polysaccharide fraction fromTinosporacordifoliawas found to be very effective inreducing the metastatic potential of melanoma cells. Therewas a 72% inhibition in the metastases formation in the lungs of syngeneic mice, when the drug was administered simultaneously with tumors challenge. Biochemicalparameters such as lung collagen hydroxyproline,hexosamines and uronic acids that are markers ofneoplastic development were reduced significantly in thetreated animals compared with the untreated controlanimals. The treatment could also reduce serumglutamyltranspeptidase and sialic acid levels as comparedto the control animals. [7]

2. Radiation Therapy

A study published in "Evidence-Based Complementary andAlternative Medicine" demonstrated that giloy may helpprevent negative side effects of radiation treatment. Theexperiment, which was conducted on adult male mice,focused on the damaging testicular effects of

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radiationtreatment in males. Male mice who underwent treatmentwith giloy and were exposed to radiation suffered fromfewer testicular lesions and other negative side effects thanthose who were not treated with giloy. These studiessuggest that giloy may be effective in preventing infertilityand related problems in men who undergo radiationtreatment. [8]

3. Against AIDS

Giloy may also be beneficial for people with HIV and otherautoimmune disorders. Giloy's traditional use as animmune stimulant led researchers to study its effects onpatients with HIV. In a study published in the "IndianJournal of Pharmacology," 60 percent of HIV patients who received giloy treatment reported a decrease in diseaserelatedsymptoms, as opposed to only 20 percent whoreceived placebo treatment. This study suggests that giloymay improve the immune systems of patients with HIV andother immune disorders, while also alleviating commonside effects of these conditions. [9]

4. Anti Diabetic Activity

The extract of T. cordifoliastem ameliorates thederangements in lipid metabolism caused by diabetesmellitus in streptozotocin induced diabetic rats. [13] The oral administration of various extracts (hexane, ethyl acetateand methanol) of T. cordifolia stem was found to havepotent antidiabetic property by reducing blood sugar levelin streptozotocin induced diabetic rats at a dose of 250mg/kg. [14] The polyherbal formulation, Dihar containingeight different herbs viz., Syzygiumcumini, Momordicacharantia, Emblicaofficinalis, Gymnemasylvestre,Enicostemma littorale, Azadirachtaindica, T. cordifoliaandCurcuma longa significantly reduces level of lipidperoxidation and increases activity of antioxidant enzymesin streptozotocin induced diabetic rats. [12] The ethylacetate, dichloromethane, chloroform and hexane extractsofT. cordifoliastem were evaluated for alpha glucosidaseinhibition activity and resulted that the dichloromethaneextract was the most effective i.e. 100% inhibition of thealpha glycosidase than others. [15] The ethanol extract of T.cordifoliademonstrates an androgenic activity. [16]Saponarin isolated from leaf extract of T. cordifoliashowedhypoglycemic activity at doses of 20-80 mg/kg. [17] Thehydro alcoholic and chloroform extracts of T. cordifolia stem demonstrates significant antidiabetic property at 250and 500 mg/kg dose dependently in alloxaninduceddiabetic rats.Pharmacological studies have proven in vivoantidiabetic potential of various extracts of T.cordifolia. It has been reported to mediate its antidiabeticpotential through myriad of biologically activephytoconstituents isolated from different parts of plant,including alkaloids, tannins, cardiac glycosides,flavanoids, saponins and steroids . These compoundshave been reported to encompass different targetactivities in diabetic conditions, thus enabling thepotential application in experimental and clinicalresearch. Kannadhasan R and VenkataramanS studyreported that 30 days treatment of Sedimental extract ofTinosporacordifolia(SETc) (1000mg/kg/p.o) ondiabetic subjects was proven for its efficacy and clearlyestablishes the antidiabetic activity with antiobese bodybuilt . The Ethanolic extract of Tinosporacordifolialeaves in different dosages (200 and 400 mg/kg b.w.)administered orally for 10 days and 30 days instreptozotocin diabetic albino rats. It is clearly showedthat TC has significant antidiabetic activity in diabeticanimals and has an efficacy of 50% to 70% compared toinsulin . Borapetoside C isolated from Tinosporacrispa (5 mg/kg, i.p.) attenuated the elevated plasmaglucose in diabetic mice, increased glucose utilization,delayed the development of insulin resistance and thenenhanced insulin sensitivity. The activation of insulininducedIR-Akt-GLUT2 expression in liver and theenhancement of insulin sensitivity may havecontributed to the hypoglycemic action of borapetosideC . The isoquinoline alkaloid rich fraction from stem,including, palmatine, jatrorrhizine, and magnoflorine have been reported for insulin-mimicking and insulinreleasingeffect both in vitro and in vivo]. In Ehrlichascites tumor cells model, water, ethanol and methanolextracts of the herb showed glucose uptake-stimulatoryactivity. The protective effects of Tinosporacordifoliaroot extract were reported in presence ofhigher level of anti-oxidant molecules and enzymes.Tinosporacordifoliaroot extract has been shown tosignificantly counterbalance the diabetes-associatedoxidative stress in the maternal liver by lowering thelevels of malondialdehyde and reactive oxygen speciesand the increased levels of glutathione and total thiols. Oral treatment of Tinosporacordifolia(100 and 200 mg/kg body weight) for 14 days mediates its antidiabeticpotential through mitiga [10, 11]

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5. Anticancer Activity

The active principles from T. cordifolia enhance hostimmune system by increasing immunoglobulin and bloodleukocyte levels and by the stimulation of stem cell proliferation. It has the ability to reduce solid tumourvolume by 58.8%, which is comparablecyclophosphamide, a known chemotherapeutic agent.activity, this activity is mostly shown in animal models.The extraction of alkaloid palmatine from Tinosporacordifoliaby using response surface methodology(RSM) clearly indicate the anticancer potential in 7,12-dimethylbenz(a)anthracene DMBA induced skin cancermodel in mice]. A single application of Tinosporacordifoliaextract at a dose of 200, 400 and 600 mg/kgdry weight, 24 hrs prior the i.p. administration ofcyclophosphamide (at the 50 mg/kg), significantlyprevented the micronucleus formation in bone marrowof mice, in a dose dependent manner. C57 Bl micewhen received 50% methanolic extract of Tinosporacordifoliaat a dose 750 mg/kg body weight for 30 daysshowed increase in life span and tumor size wassignificantly reduced as compared to control .Mishra R et al study investigated the anti-brain cancerpotential of 50% ethanolic extract of Tinosporacordifolia(TCE) using C6 glioma cells. TCEsignificantly reduced cell proliferation in dosedependentmanner and induced differentiation in C6glioma cells . ManjuBala et al study evaluatedeight secondary metabolites from Tinosporacordifoliaagainst four different human cancer cell lines,KB (human oral squamous carcinoma), CHOK-1(hamster ovary), HT-29 (human colon cancer) and SiHa(human cervical cancer) and murine primary cellsrespectively. All extracts and fractions were activeagainst KB and CHOK-1 cells whereas among the puremolecules palmatine was found to be active against KBand HT-29; tinocordiside against KB and CHOK-1; yangambin against KB cells . Two molecules fromhexane and methanol fractions (T1 and T2) from theplant Tinosporacordifoliashow that inMCF-7 cells, T1treatment significantly suppressed the proliferation,migration and invasion of MCF-7cells when comparedto that of T2. Epithelial–mesenchymal transition relatedgenes, Twist and Snail, were downregulated by T1 withincreased transcription of E-cadherin [18, 19]These immunostimulating properties can be used in theprevention of tumour mediated immunosuppression andhence could be a drug choice for various cancers.

6. Anti Allergic Activity

Tinosporacordifoliahas been studied for its anti allergic effect. It was found that T cordifoliaprovided significantrelief from sneezing, nasal discharge, nasal obstruction, andnasal pruritus compared with placebo with consistentimprovements on examination of the nasal smears andnasal mucosa. [20]

7. As an Immunomodulator and against HepaticAmoebiasis

The activity of a crude extract formulation was evaluated inexperimental amoebic liver abscess in golden hamsters andin immunomodulation studies by Youvraj R Sohniet al.The formulation comprises the following five plantsBoerhaviadiffusa, Tinosporacordifolia, Berberisaristata,Terminaliachebula and Zingiberofficinale. Theformulation had a maximum cure rate of 73% at a doseof 800 mg/kg/day in hepatic amoebiasis reducing theaverage degree of infection (ADI) to 1.3 as compared to4.2 for sham-treated controls. In immunomodulationstudies humoral immunity was enhanced as evidenced bythe haemagglutinationtitre. The T-cell counts remainedunaffected in the animals treated with the formulationbut cell-mediated immune response was stimulated asin the leukocyte migration inhibition (LMI)tests. [21]

8. Anti-inflammatory Activity

A study was conducted by Siddalingappa C M et al. It has been observed that Tinosporacordifoliashowed significantincrease in the reaction time (pain threshold) in doses of 100mg/kg, 200 mg/kg, 100 mg/kg with 5 mg/kg ofdiclofenac after 30, 60 and 90 minutes of administration.

Tinosporacordifoliais well known for itsimmunomodulatory response. Active compounds 11-hydroxymustakone, N-methyl-2-pyrrolidone, Nformylannonain,cordifolioside A, magnoflorine, tinocordiside and syringin has been reported to havepotential immunomodulatory and cytotoxic effects . VaibhavAher et al study confirms theimmunomodulatory activity of Tinosporacordifoliaethanolic extract (100 mg/Kg/p.o.) stem throughaltering the concentration of antioxidant enzymes,increasing T and B cells and antibody which play animportant role in immunity, enhancing theconcentration of melatonin in pineal gland andincreasing the level of cytokines like IL-2, IL-10 andTNF-α which plays an important role in immunity .Inthe same above

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doses, Tinosporacordifoliashowed 32.63%,36.63% and 40.5% inhibition of paw edema respectively atthe end of three hoursAqueous Tinosporaextracts has been also reported toinfluence the cytokine production, mitogenicity,stimulation and activation of immune effector cell. Polymorphonuclear leucocytes (PMN) cells are animportant component of the host defence system.Extracts of Tinosporacordifoliawere able to stimulate the PMN cells for phagocytosis of added Candida cellsthrough an in vitro slide method of phagocytosis .Orally administration of T cordifolia alcoholic extract(100 mg/kg, p. o) was found distinct increase in footpad thickness and also significant increase in theWBC counts and bone marrow cells significantlyindicating stimulatory effect on haeomopoeticsystem, it shows potent immunomodulatory action. Bharti Umretia et al study Results suggest thatGuduchi Ghana (concentrated form of aqueousextractof Guduchi) prepared by classically was found topossess significant immunostimulatory action onimmune system . A randomized, controlled,parallel, pilot clinical study demonstrate effect of theformulated Tinospora lotion for Interleukin-1,Interleukin-6 and Interleukin-8 using blood serumsamples. Down regulation of Interleukin 1, 6, and 8levels in scabies infestation inhibits hyperkeratosis andinfiltration of inflammatory cells into scabietic lesion.The modulation effect of the Tinospora lotion oninterleukin levels reinforces its anti-scabies activity. [22]

9. Antioxidant Activity

Anilakumar K R et al. has studied the in-vitro antioxidant activity of Tinosporacordifolia. It has been observed thatTinosporacordifoliaexhibited excellent antioxidant activityin methanol, ethanol and water extracts. The observed high antioxidant activities of the extracts indicate the potentialof the stem as a source of natural antioxidants ornutraceuticals to reduce oxidative stress with consequenthealth benefits.The Tinosporacordifoliahas potentialapplication in food systems as an antioxidant andprobably in biological systems as a nutraceutical.Methanolic, ethanolic and water extracts of Tinosporacordifoliashowed significant antioxidant potentialcompared to other solvents and also possess metalchelation and reducing power activity . VSivakumar et al study Results suggest that Tinosporacordifoliastem methanol extracts administered orallyincreased the erythrocytes membrane lipid peroxide andcatalase activity. It also decreased the activities ofsuperoxide dismutase, glutathione peroxidase inalloxan-induced diabetic rats . Tinosporacordifoliahas the ability to scavenge free radicalsgenerated during aflatoxicosis. Tinosporacordifoliashowed protection against aflatoxin-inducednephrotoxicity due to the presence of alkaloids such asa choline, tinosporin,isocolumbin, palmatine,tetrahydropalmatine, and magnoflorine . NehaUpadhyay et al study results suggest that Tinosporacordifoliabark ethanol extracts showed the highest freeradical scavenging activity compared to the methanolextracts and also ethanol extracts had the highestphenolic content. The administration of ethanolicextract of Tinosporacordifolia(EETC) in Nnitrosodiethylamine(DEN) induced liver cancer in maleWister albino rats reverted the lipid peroxidation (LPO)levels, enzymic and nonenzymic antioxidants to nearnormal . Essential oil isolated from leafof Tinosporacordifolia(Willd.) was shown strong 2,2- [23]

10.Antiulcer Activity

D. N. K. Sarmaet al. has studied the antiulcer activity byusing the ethanolic extracts of the roots of T. cordifoliaandwas observed that, it induces a marked protective actionagainst an 8 h restraint stress induced ulcerization, whichis comparable to that of diazepam. [24]

11.Wound Healing Activity

Umesh Jain et al. has observed that, the methanolic extractpossesses significant wound healing promoting activity ofTinosporacordifolia.The study suggested that themethanolic extract of Tinosporacordifoliapossesses betterwound healing potency, which was evident by theincreased rate of wound contraction; reduction in theperiod of epithelialization, increase in collagen depositionand increase in tensile strength in granulation tissue. [25]

12.Mental Disorder

The whole plant and the juice of the leaves are traditionallyused in various mental disorders. This is regarded as one ofthe best psychotropic drugs in India. [26]

13.Effect on Memory

T. cordifoliahas also been shown to enhance cognition(learning and memory) in normal rats and reversecyclosporine-induced memory

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deficit. Both the alcoholicand aqueous extracts of T. cordifoliaproduceda decrease in learning scores in Hebb William maze andretention memory, indicating enhancement of learningand memory. [27]

14.Against Dengue

The capsule developed from giloy is useful in thetreatment of Dengue. It is very much useful in ayurvedictreatment. [28]

15.Trace Element Studies

Traditionally, Tinosporacordifoliaused medicinal plant inIndia for curing ailments ranging from common cold, skindiseases, and dental infections to major disorders likediabetes, hypertension, jaundice, rheumatism, etc. Tounderstand and correlate their medicinal use, traceelement studies on the aqueous extract of these medicinalplants have been carried out using particle-induced X-rayemission technique. A 2-MeV proton beam was used toidentify and characterize major and minor elementsnamely Cl, K, Ca, Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, Br, and Sr inthem. The very high concentrations of Cl, K, and Ca in allthe leaf samples, appreciable levels of Mn and high Zncontent in T. cordifolia. [7]

16.Uses and Benefits of Guduchi

All parts of guduchi plant are used for various medicinalpurposes. The plant oil is effective in reducing pain andedema and in gout and skin diseases. The herb accordslongevity, enhances memory, improves health, andbestows youth, betters complexion, voice, energy andluster of the skin. It is helpful in treating digestiveailments such as hyperacidity, colitis, worm infestations,loss of appetite, abdominal pain, excessive thirst, andvomiting and even liver disorders like hepatitis. Freshjuice of guduchi, when mixed with rock candy, speeds upthe recovery in hepatitis patients. It helps in remedyingailments like raktapitta, anemia, cardiac debility, diabetes,sexual debility and splenic disorders. The starch of theplant serves as a household remedy for chronic fever,relieves burning sensation and increases energy andappetite.The decoction of guduchi, mixed with nimba and vasa,eases the itching and oozing. It benefits general weakness,dyspepsia, impotency, dysentery, secondary syphilis,tuberculosis, jaundice, constipation, leprosy, generaldebility, cutaneous rashes and condylomata. Guduchi helpsin getting rid of renal caliculi and reduces blood urea level.The decoction of guduchi and sunthi is a good combinationfor treating gout and rheumatic disorders.Guduchi juice, when taken with cow's milk or lodhra, iseffective in combating leucorrhea. The juice is mixed withcumin seeds and consumed to reduce the burningsensation caused due to pitta. The root of guduchi is astrong emetic and used for bowel obstruction.

17.Caution

Diabetic patients are advised to use guduchi with caution,since it can lower blood sugar levels. In case you are aboutto undergo a surgery, stop consuming guduchi two weeksbeforehand, since it can interfere with blood sugar controlduring the surgery. It is better to avoid guduchi duringpregnancy and breastfeeding. [29]

18.Uses under Siddha System of Medicines

For Diabetes, the samoolam or the whole plant is crushedand juice is extracted. 2 to 3 ounce of this juice is given 3times daily before food and it is a very effective remedy tocontrol the glucose level. The leaves are baked in fire andapplied externally over the ulcers. The decoction preparedby the samoolam is an effective remedy for fever. For betterresults parpadakam, chandanam, chukku, koraikizhangucan be used for preparation of this decoction. An effective Siddha preparation called Seenthilsarkarai or Seenthiluppu is a very effective remedy for venereal diseases,diabetes, skin diseases, spleenomegally, jaundice, coughetc. Seethilleghyam is an effective remedy for suram(fever), diarrhoea, venereal diseases etc. The juice of thisplant is recommended daily in the case of AIDS. Researchwork on this plant has proved that it increases theimmunity and defence mechanism against the retro virusand increases the lifespan of the patient.For rheumatic complaints like Rheumatoid arthritis, 20to 30 ml of the juice of this plant is advised twice daily.Seenthilchoornam and Seethiluppu is found to bringexcellent results in the condtions like chronic skin ailments,bone disorders and infertility. [30]

II. CONCLUSION

This is really a miraculous herb having the choice to beused in each and every ailments. Giloy is not approved bythe Federal Drug Administration, and like other herbaltreatments as well as medications, it may produce sideeffects such as constipation. So a further study is requiredalong with the clinical trials to proof the benefits of

thisherb. Additionally, a person should consult his/her doctorbefore using giloy if having any health problem or ifpregnant or breastfeeding. [31]The present study provides valuable informationregarding the identification and authentication of theplant T. cordifolia along with the development of thesolid oral dosage form with improved formulationparameters. Antioxidant rich plants serve as source ofnutraceuticals that alleviate the oxidative stress andtherefore prevent or reduce the onset of degenerativediseases. Therefore antioxidant activity of preparedformulation was evaluated by DPPH free radicalscavenging assay. Antibacterial activity of theformulation was performed against E.coli andB.subtilus which clearly claimed its effects againstseveral infections, inflammations and several othertherapeutic benefits for human health. The presentstudy justify the use of prepared formulation of T.cordifolia tablet in treatment of various infectiousdiseases and as a source of nutraceuticals in order toreduce oxidative stress with consequent health
benefits. So further work could be done for theisolation and purification of importantcompoundsfrom this plant which will allow the scientificcommunity to utilise as an accessible alternative forthe production of synthetic antibiotics. It shows manypharmacological activities as well. Hence this providesus a great scope of investigation regarding futureprospects also.

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