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Phenolic Extract of Galinsogaparviflora and Comparative Study with Dapsone

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ABSTRACT
The present study investigates the antimicrobial and anti-inflammatory potential of the phenolic extract of Galinsoga parviflora (GP) in comparison with the synthetic sulfone drug Dapsone. G. parviflora, a widely distributed medicinal herb, is traditionally used for wound healing, infections, and inflammatorydisorders. Ethanolic extracts are rich in flavonoids, phenolic acids, tannins, and terpenoids, which contribute to its pharmacological actions. Antimicrobial activity was evaluated against selected bacterial and fungal strains using agar well diffusion and MIC determination, while anti-inflammatory activity was assessed through in vitro assays (protein denaturation, membrane stabilization, nitric oxide scavenging) and in vivo carrageenan-induced paw edema in rats. Preliminary findings suggest that ethanolic extracts of G. parviflora possess broad-spectrum antimicrobial and significant anti-inflammatory activity, though generally less potent than Dapsone. The plant extract's multi-targeted, antioxidant-rich actions highlights its potential as a natural, safe, and affordable complimentary to synthetic drugs.
KEYWORDS: Galinsogaparviflora, phenolic extract, Dapsone, pharmacology.

I. INTRODUCTION

Naturalproductshaveanimportantroleinthe developmentofnewmedicinalmedicines.Galinsogap arviflora (family Asteraceae), sometimes known as "Gallant Soldier," is a fast-growing plant having ethno-medicinal properties. Traditionally, it was used to treat wounds, microbial infections, and inflammatory diseases.

Phytochemical investigations show that ethanolic extracts of the plant contain flavonoids (quercetin, luteolin), phenolic acids (chlorogenic and caffeic acid), tannins, and terpenoids, all of which have antibacterial and anti- inflammatory activities. Dapsone (4, 4′-diaminodiphenylsulfone) is a well-known antibacterial medication that is primarily used to treat leprosy, dermat it is herpetiform is, and Pneumocyst is jirovecipneumonia. Inadditionto its antibacterial effects, Dapsone has anti-inflammatory properties via inhibiting neutrophil migration and oxidative processes mediated by myeloperoxidase. The current comparative study aims to determine if G. Parviflora ethanolic extract can be used as a natural alternative or supplement to dapsone in the treatment of microbiological and inflammatory illnesses.

OBJECTIVE OF THIS STUDY

Thestudy'sobjectivesweretoidentify,authen ticate,andreviewtheliteratureontherapeuticplants.toe valuate Galinsoga parviflora's pharmacognstics. to use a solvent to perform polarity-based extraction. to conduct phytochemical research on several Galinsoga parviflora extracts. Evaluation of Galinsoga parviflora's antibacterial activities utilizing phenolic extract

OBJECTIVE OF STUDY DRUG (DAPSONE)

The purpose of the study is to identify, authenticate, and review the literature on medicinal plants. to evaluate Galinsoga parviflora's pharmacognstics. to use a solvent to perform polarity-based extraction. to conduct phytochemicalresearchonseveralGalinsogaparviflor aextracts.Galinsogaparviflora'santi-inflammatoryand antibacterial properties were estimated using Google Scholar and Pubmed.

Drugprofile

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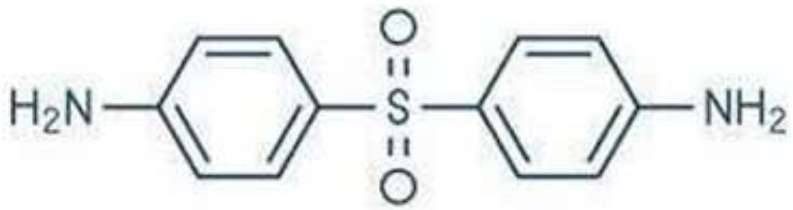

dapsone

GenericName: Dapsone **Brandname**; Aczone
Chemicalformula:C12H12N2O2S
OtherNames:4,4'-Diaminodiphenylsulfone(DDS)
DrugClass: Sulfone,Antibacterial,Anti-inflammatoryagent **Types**: Syntheticsulfone compound

CHEMICALINFORMATION
MolecularFormula:C12H12N2O2S
MolecularWeight:248.30g/mol
Structure:Twobenzenerings linkedbyasulfone groupwithaminogroups atParapositions

PHARMACOKINETICS
Absorption: Wellabsorbedorally(70–80%)
Distribution: Widelydistributed;highinskin,liver,kidneys,muscle
ProteinBinding:~50–70%-
Metabolism:Hepatic(acetylationandhydroxylation)–
Excretion:Renal-Half-life:20–30hours

MECHANISMOFACTION

Dapsone is a sulfone antibiotic that works by preventing bacteria from producing dihydrofolic acid. It blocksthe enzyme dihydropteroate synthase, which is necessary for bacteria to produce folate, by acting as a competitive antagonist of para-aminobenzoic acid (PABA). Instead of directly killing bacteria, this inhibition has a bacteriostatic impact by interfering with the creation of bacterial DNA. Dapsone has anti-inflammatory qualities in addition to its antimicrobial effect because it inhibits the release of reactive oxygen species and decreases neutrophil chemotaxis. Dapsone is useful in treating diseases including leprosy, dermatitis herpetiformis, and several inflammatory dermatoses because of their combined effects.

Antimicrobial:Inhibitsbacterialdihydropteroatesynthase
↓
Dihydrofolicacidsynthetase

THERAPEUTIC USES
InfectiousDiseases:

Leprosy(Hansen's disease)Pneumocystis jiroveciipneumonia(PCP)Toxoplasmosis
Dermatological Conditions: Dermatitisherpetiformis LinearIgAdiseaseBullous pemphigoid Pyoderma gangrenosum

Others
Vasculiticandautoimmuneconditions

Dosage
Leprosy: 100 mg orally once daily Dermatitisherpetiformis:50mg/day,titrated **Adverse Effects**
Common:Nausea,vomiting,headache,dizzinessanemia
Serious:Hemolysis,methemoglobinemia,agranulocytosis,Aplasticanemia,hepatotoxicity,
Contraindications
Hypersensitivitytodapsone/sulfone Severeanemia-G6PDdeficiency(relative)
DrugInteractions
Rifampicin: Increases metabolism Trimethoprim,probenecid:Alterclearance
Clofazimine: Increases GI side effects
Precautions
MonitorCBC,liver,renalfunctionScreenfor G6PD deficiency
(CBC-Completebloodcount)
(G6PD–Glucose-6-phosphateDehydrogenase)

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Plant	Commonmedicinaluses	Sideeffects
Galinsogaparviflora Gallent soldier Family(Asteraceae)	Galinsogaparviflora,commonl y known as **gallant soldier**or **Quickweed**, has diversetraditionalusesasafood and medicine. Its young shoots and leaves are eatenas a vegetable or in salads and soups, particularly in Latin America, Africa, and Asia. Medicinally,it'susedtopicallyf or skin conditions like eczema and wounds, and orallyforcolds, flu, and as an anti-inflammatory,with potential benefitsfor wound healing and scurvy due to its VitaminCcontent.Extractshav e also shown antibacterial, antifungal, and antioxidant properties, along with potentialbloodsugarandUV protectiveeffects.	Galinsoga parviflora is generally considered sometimes toxic and is used asafoodsourceinsoupsand salads, but specific, severe side effects are not widely reported in human studies. However, its ethno medicinalusesforconditions like inflammation and colds need more research. While no significant toxicity wasseeninanimalstudiesat certaindoses,certainextracts have shown in vitroCytotoxicityeffectson fibroblasts, suggesting aneed for caution with concentrated extracts or specific preparations
Neem AzadirachtaindicaA Family;(Meliaceae)	Neem has diverse uses, including as a natural pesticideand repellent dueto its antifeedant and growth-regulatingproperties,andfor its medicinal benefits in treating skin infections, promoting healthy hair, and improving oral health. In traditionalmedicine,itisalso used to boost the immune system, detoxify the body, and manage conditions like diabetes, inflammation, and digestiveissues.Neemisalso incorporated into cosmetics, soaps,andoralcareproducts due to its antibacterial, antifungal, and anti-inflammatory properties	Potentialsideeffectsofneem include liver and kidney damage, allergic reactions, nausea,fatigue,andtoxicity, especiallywith long-term or high-dose oral use. Oral consumption is particularly dangerous for infants and children and should be avoided by pregnant and breastfeeding women.
Fennel Foeniculumvulgare Family ;Apiaceae	Fennel is used in cooking for itssweet,licorice-likeflavorin meat,fish, salads, and baked goods. It also has medicinal uses,suchasaidingdigestion, relieving bloating, and freshening breath. Fennel seeds are used in traditional medicine to treat respiratory issues, and they containcompoundsthatmay help regulate female hormonesandincreasebreast milk production.	Mainsideeffectscan includeallergicreactionslike rashes and difficulty breathing, increased sun sensitivityand skin reactions, digestiveupset,andhormonal effects such as premature breast development. Other rare but serious side effects are hallucinations and seizures, especially when fennel oil is used in large amounts. Fennel may also interact withmedicationslike tamoxifen and is not considered safe for pregnant or breastfeeding indiduals

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Cinnamon (Cinnamomum zeylanicum, Family(Lauraceae)	Cinnamon'sprimaryuseisasa popular aromatic spice and flavoringinmanyfoodsand drinks, but it is also used in Ayurvedic medicine to addresssymptomslikecolds, digestion issues, and heart problems. Some evidence suggests potential health benefits such as improved heart health, better blood sugar control, and enhanced cognitive function, though more human research is needed to confirm these effects.	Themainsideeffectsof cinnamon are livertoxicity(fromhighamountsof Cassiacinnamoncontaining coumarin), mouth andthroatirritation, and allergic reactions including skinirritationand breathingdifficulties. Excessiveintakecanalsolead togastrointestinalproblems, and inhaling drypowdercan cause serious lung issues. People on blood-thinning, diabetes,orlivermedications should be cautious, andpregnantwomenshould limit intake to food-level amounts.

ParvifloracontainsvariousPhytochemicalincludingFlavonoids(quercetin,luteolin)Phenolic acids (chlorogenic, caffeic), tannins, terpenoids, and saponins.

Plantprofile;-

Taxonomy
Kingdom:PlantaeDivision:Magnoliophyta(Angiosperms) **Class**:Magnoliopsida(Dicotyledons)
Order:Asterales

Family: Asteraceae (Compositae) **Phylum**:Magnoliopsida(Angiosperms) **Genus**: Galinsoga
Species:parvifloraCav.CommonNames:GallantSoldier,Quickweed,Guasca(Colombia),andPotato weed.

Botanicaldescription
Habit: Annual, herbaceous, fast-growing plant.
Stem: Erect,branched,cylindrical,soft,upto75cm.
Seed:Asmall,dry,indehiscent,one-seededfruit)
Inflorescence: Smallheads(capitula)inlooseclusters(panicles)

Leaves: Opposite, ovate, serrated, 2–7 cm long.
Flowers:Small,yellowdiscfloretswith3–5whiterays.
Fruits: Small brown achenes with pappus bristles.
Root:Fibrousrootsystem

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IDENTIFICATIONTESTFOR ALKALOIDS

Testname	Procedure	Observation	inference
Dragendorff' s Test	Add few drops of Potassium bismuthiodidesolutiontothe extract	Orangeorreddish- brown precipitate	Presenceofalkaloids
Mayer'sTest	Add few drops of Potassium mercuriciodidesolutiontothe extract	Creamorwhite precipitate	Presenceofalkaloids
Wagner's Test	Add few drops of Iodine in potassiumiodidesolutiontothe extract.	Reddish-brown precipitate	Presenceofalkaloids
Hager'sTest	AddfewdropsofSaturatedpicric acid to the extract	Yellowcrystalli ne precipitate	Presenceofalkaloids

IDENTIFICATIONTESTFORFLAVONOIDS

Test	Procedure	Observation	Inference
Shinoda(Magnesium – HCl) test	AddMgribbonto extract,thenaddconc. HCl. P	Pink/red/orange coloration.	Presenceofflavonoids
Alkalinereagenttest (NaOH)	AddNaOHtoextract →yellow,andthen add HCl → color disappears.	Yellowcolorthat disappears on acidification.	Presenceofflavonoids
Leadacetatetest	Add10%lead acetatereagentto extract	Yellowprecipitation	Presenceofflavonoids
Ammoniatest	Add10%NH4OH or ammonia vapour. Extract paper/TLCPlate to reagent	Yellow to green fluorescenceunde r UV.	Presenceofflavonoids

IDENTIFICATIONTESTFORGLYCOSIDES

Testname	Procedure	observation	Inference
Borntragertest	Powdered drug is boiledwithsulphuric acid and filtered. Thefiltrateisshaken with benzene. Theorganiclayeris separatedandshaken with ammonia solution	Pinktoredcoloration indicatesanthraquino ne glycosides	Presenceofglycosides
Killer-killianitest	Extractistreated withglacialacetic acid containing traces of ferric chloride. Thenconc. sulphuric acid is carefullyaddedtoit.	Abluegreenringatthe junctionthatindicatesthe presence of cardiac glycosides.	Presenceofglycosides

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IDENTIFICATIONTESTFORCARBOHYDRATES

Testname	Procedure	Observation	Inference
Molisch'stest	Take2mloftest solution. Add 2 drops of Molisch;s reagent(alcoholic alpha naphthol)Carefull yaddconc. sulphuricalongthe sideofthetesttube.	Violetringatjunction atthesideofthetest tube	Presenceofcarbohydrates
Fehling'stest	Mixequalvolumeof Fehling'sA(copper sulphate)Fehlings'B (alkaline sodium potassium tartarte). Add the mixture to testsolution.Heatin boiling Bathalongthesideof the test tube	Brickredprecipitated	Presenceofcarbohydrates

IDENTIFICATIONTESTFORSTEROLSANDTANNINS

Testname	Procedure	observation	Inference
Liebermann Burchard'test	Dissolvethesamplein chloroform Addaceticanhydride Thencarefullyadd conc.h2so4	Formation ofablue green	Presenceofsterolsand presence of tannins
Salkowski test	Dissolve the extract in chloroform,addconc.sulfuric sulphuricacidfromthesideof thetesttube	Aredorreddish brown colour appears at the interface	Presenceofsterolsand presence of tannins

IDENTIFICATIONTESTFORSAPONINS

Testname	Procedure	Observation	Inference
Foamtest	Takesmallquantityof plant extract. Shakeitvigorously withwaterinatest tube.	Persistent frothing formation lasting for at least 15 mins.	Presenceof saponins
Sodiumbicarbonate test	Takeasmallamountofthe plant extract Add5mlofdistilledwater and shake vigorously. Add2-3dropsof5% sodiumbicarbonate solution. Shakethemixture again	Formationofstable,Persistent froth(foam) for 15 mins	Presenceof saponins

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IDENTIFICATIONTESTFORPHENOLICCOMPOUNDS

Test	Procedure	Observation	Inference
Ferricchloridetest	Addfewdropsof5%of neutralferricchloride solution to the test solution.	Formationofviolet, blue, green or red coloration	Presenceofphenolic compounds.
Leadacetatetest	Addafewdropsof10% leadacetatesolutionthe extract.	Formationofbulky white precipitate.	Presenceofphenolic compounds.

IDENTIFICATIONTESTFORPROTEINAND AMINOACIDS

Test	Procedure	Observation	Inference
Biurettest	Proteinswithtwoor morepeptidebondsis reactwithcopperions inalkalinesolution	Presenceofvioletor purple complex	Presenceofaminoacids
Millon'stest	Tyrosinereactswith glyoxalinacidinthe presenceofconc. sulphuricacid	Violet ring at the junctionofthetesttube	Presenceofproteins
Ninhydrintest	Amino acids(except proline and hydroxyproline)react with ninhydrin	Indicatesthatblueor purple colour	Presenceofproteins

ANALYTICAL PROCEDURE:

ChromatographicAnalysis–
TLC:Separation&identificationofflavonoidsandphenolicacidsHPTLC: Quantitative fingerprinting of flavonoids
HPLC:Quantificationofchlorogenicacid,caffeicacid,quercetin,luteolin GC–MS: Analysis of volatile compounds and fatty acids

SpectroscopicAnalysis
UV–Vis:Totalflavonoidsandphenoliccontent
FTIR:FunctionalgroupidentificationNMR&MS:Structuralelucidationofisolatedcompounds

QuantitativeEstimations
TotalPhenolicContent(TPC):Folin–Ciocalteumethod,mgGAE/gextract
TotalFlavonoidsContent (TFC)Aluminumchloridemethod,mgQE/gextract
Antioxidant assays: DPPH, ABTS, FRAP methods

PharmacologicalScreening(ifrequired)
Anti-microbialactivity Agar diffusion
MIC/MBCBybrothmicrodilution
MIC-Minimuminhibitoryconcentration

Confirmatoryassays
TLCbioautography
Timekillkinetics(bacteriostaticvs.bactericidalaction overtime)

METHODSOF PREPARATION

CollectionandAuthentication;-

Collect fresh aerial parts (leaves, stems, flowers) of Galinsoga parviflora from a natural habitat. Authenticate the plant specimen by a botanist; preserve voucher specimen in herbarium. Wash thoroughly with distilled water to remove dust and soil.

DryingandPowdering

Dry the plant material under shade at room temperature (25–30 °C). Avoid direct sunlight to prevent degradation of phytoconstituents. Grind into coarse or fine powder using a mechanical grinder. Store airtight container.

ExtractionProcedure

Take powdered material (50–100 g). Extract with ethanol (or methanol, water, chloroform, etc.) using Sox let extraction (6–8 h) or cold maceration (24–72 h). Filter and concentrate the extract using rotary evaporator. Store extract at 4 °C until analysis.

PharmacologicalActivities

- **Antioxidant:**Containsflavonoids,phenoliccompounds,andsteroidswhichscavengefreeradicals, providingcellular protection.

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- **Anti-inflammatory:**Itshydroalcoholicandaqueousextractscaninhibitinflammatoryresponsesandareused to treatinflammatoryskinconditions..
- **Antdiabetic:**Showspromiseinmanagingdiabetesbyinhibitingα-glycosidaseand potentiallyloweringbloodsugar levels.
- **Hepatoprotective:**ExtractsofG.parviflorahave demonstratedprotectiveeffectsontheliver.
- **WoundHealing:**Theplantisusedtraditionallyto promotewoundhealingandstopbleedingduetoitsabilitytocoagulateblood.
- **Antidiabeticactivity**:Showntoreducebloodglucoselevels
- **Antielminticactivity**:Decoctionsusedagainstintestinalworms;

II. DISSCUSION

ThephenolicextractofGalinsogaparviflorahas greatbiologicalpotential,particularlyinantibacterialandanti- inflammatory properties, which are comparable to the pharmacological profile of dapsone. G. parviflora, often known as gallant soldier, is a medicinal herb high in bioactive substances including flavonoids, phenolic acids, tannins, and alkaloids. The phenolic compounds, specifically gallic acid, caffeic acid, and quercetin derivatives, are principallyresponsible for its potent antioxidant and antibacterial properties. These chemicals scavenge free radicals, block bacterial enzymes, and modulate inflammatory pathways, imitating some of the mechanisms by which dapsone works. Because of its antibacterial and anti-inflammatory qualities, dapsone (4,4′-diaminodiphenyl sulfone) is a synthetic sulfone medication that is frequently used to treat leprosy, dermatitis herpetiformis, and acne. It primarilyhas bacteriostaticeffects byblockingtheenzymedihydropteroatesynthase, which is involved in the synthesis of folate in bacteria. Its anti-inflammatory properties are further enhanced by its capacity to inhibit neutrophil activity. However, dapsone's long-term clinical value is limited by its frequent sideeffects,whichincludehemolyticanemia,methemoglobinemia,andhypersensitivityresponses.Thephenolic extract of G. parviflora showed significant antibacterial efficacy against both Gram-positive and Gram-negative bacteria in comparative investigations. Its effectiveness is enhanced by a wide range of antioxidant actions, which may improve tissue repair and lessen oxidative stress in inflammatory circumstances, even if its potency may be lower than that of pure dapsone. By destroying bacterial cell walls, interfering with protein synthesis, and changing membrane permeability, the extract's phenolic chemicals prevent microbial development. Furthermore, the extract's anti-inflammatory properties, which are linked to the suppression of pro- inflammatory mediators including cytokines and nitric oxide, are similar to dapsone's immunomodulatory properties.The phenolic extract provides a natural and possibly safer therapeutic substitute for dapsone. Due to the combined action of several bioactive compounds, plant-derived phenolics may provide synergistic effects and are less likely to cause significant systemic toxicity than synthetic medicines. Prior to clinical application, however, standardization, dose adjustment, and pharmacokinetic profiling are essential. Comparative findings indicate that G. parviflora extract offers a versatile, low-toxicity strategy appropriate for creating supplemental or adjunct medicines in the management of infections and inflammatory illnesses, even though dapsone is still more effective at the molecular level. In summary, Galinsoga parviflora's phenolic extract shows encouraging antibacterial and anti-inflammatory qualities that are similar to dapsone in mechanism but not in absolute potency. Its promise as a safer phytotherapeutic substitute in upcoming pharmaceutical formulations is highlighted by its natural origin, antioxidant advantages, and decreased toxicity profile.

III. CONCLUSION

Due to its strong phenolic and flavonoid chemical makeup, Galinsoga parviflora has significant antibacterialand anti-inflammatory activity, according to research comparing its phenolic extract to dapsone. Thesebioactive components demonstrate pharmacological effects comparable to those of dapsone by working in concert to suppress microbial growth, neutralize free radicals, and alter inflammatory pathways. Although dapsone is still a powerful and scientifically validated synthetic medication, side effects like hemolysis and hypersensitivity reactions frequently restrict its use. G. parviflora extract, on the other hand, provides a safe, natural, and multi-targeted substitute with extra antioxidant advantages.

The comparative results indicate that while the phenolic extract may not have the same effectiveness asdapsone, it has great potential as a supplemental or replacement treatment, especially

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when long-term usage of synthetic drugs carries a risk of toxicity. Isolating particular active ingredients, figuring out the best dosages,and carrying out in vivo and clinical trials to confirm safety and efficacy should be the main goals of future research. All things considered, Galinsoga parviflora's phenolic extract is a useful phytochemical resource for creating novel antibacterial and anti-inflammatory drugs with fewer adverse effects and greater therapeutic potential.

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