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Ethnobotanical and pharmacological profile of *galinsoga parviflora*

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Abstract

Galinsoga parviflora is a member of the *Astraceaea* family. Widely distributed in Central and South America, Europe, the West Indies, Mexico, Australia, Africa, and Asia are all home to it. In Asia it is mainly found in different areas of Pakistan.The herb is used in traditional medicines for wound healing, blood coagulation issues, colds, flu, toothaches, and other ailments, disorders of the skin and eyes. *Galinsoga parviflora*'s therapeutic powers are attributed to the presence of a variety of secondary metabolites. The plant is non-toxic and utilised as livestock feed.It is also used as a vegetable in soups and salads by humans.Antibacterial, antifungal, antioxidant, anti-inflammatory nematicidal, urease, alpa-glucosidase activity, anti-cytotoxic anti-hyperglycemic, respectively properties have been observed in crude extracts and pure chemicals obtained.More than thirty-eight chemicals constituents have been isolated from *Galinsoga praviflora.* The current study focuses on *Galinsoga parviflora's* ethno-medicinal usage, isolated natural components, and biological activity.

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Introduction

Galinsoga parviflora (gallant soldier) is a common spring annual weed found all over the world [1]. It can be found in many temperate and subtropical regions of the world, in disturbed habitats and agricultural areas (fields, vegetable gardens, flower beds) [2]. Residents of Richmond, West London, gave it the name *Galinsoga parviflora* around 1860[3]. The Latin term "*parviflora*" means "*little flower*" (from the words "parvo" which means "little, tiny" and "flor" which means "flower") appears to be related to the flower's tiny size [4]. Because of its capacity to grow and mature fast, *Galinsoga parviflora* is commonly referred to as *"quickweed*" [5]. Another common name for this plant is *"waterweed,"* which possibly relates to its exceptional ability to spread quickly everywhere like water [6]. *Galinsoga parviflora* can sometimes be known as "*potato weed" or "yellow weed"* [7]. The herb is reported to be used for medical and traditional purposes.The plant also posses various biologigal activites such as Alpha-glucosiadase inhibitor & hypoglycemic,Anti Microbial, Anti oxidant, Anti inflammatory, Anti cancer etc [1].

Pharmacognosy of *Galinsoga praviflora;*

Figure 1: *Galinsoga parviflora* view

B.S

Galinsoga praviflora is a herbicious plant belonging to family *Astereaceae* [8].

Geographical source

- The hilly region of Central America is thought to be the origin of *Galinsoga parviflora* [4].
- Occuring mainly in Newzeland,United Kingdom, Central America, South America, Europe, West Indies, Mexico, Australia, Africa and Asia. In Pakistan, it can be found in Balochistan, Hunza, Dir, Swat, Gilgit, Murree and Kashmir.
- It has been identified as a weed in more than 32 crops in 38 countries [9].

Morphology

Figure 2: Morphology of *Galinsoga parviflora*

- *Galinsoga parviflora* is an annual dicot plant of the family *Asteraceae* [4].
  - The plant normally grows 60 cm tall [4].
  - Flowers of this plant are pink, 15-25 mm in diameter & with pink or red tipped ray's florets and yellow disk florets.
  - Fruit is sparsel, hairy achences.
  - Seeds are 1-1.4 mm long ,with a single row of long hairedpappusLeaves are small ,narrow,elliptical-upper leaves
  - Lower leaves are often three-lobed.
  - Leaves explode pleasant smelling when crushed.
  - Stem are long, thin, ribbed, sparsely-hairy to smooth, rooting, sprawling, upto 70cm.
  - Ref: [10,11]
  - Somatic and meiotic chromosomal analyses revealed that *Galinsogaparviflora* is a diploid, with 2n = 16 chromosomes [12,13]

Scientific Classification

Domain : *Eukaryota*
Kingdom : *plantae*
Phylum : *spermatophyte*
Subphylum : *angiospermae*
Class : *dicotyledonae*
Order : *asterales*
Family : *astraceae*
Genus : *Galinsoga*
Species : *Galinsogaparviflora*

Chemical constituents [14]

So far, 38 compounds (1-38) have been identified from *Galinsoga parviflora*. Flavonoids, aromatic esters, diterpenoids, caffeic acid derivatives, steroids, phenolic acid derivatives, and miscellaneous chemicals are the seven categories.

Table 1: Depict Chemical compounds present in *Galinsoga parviflora*

Sl: No	Chemical compound	Class of compound	Plant part	Ref
A.1	**Flavinoids**	Apigenin 7-β-D-glucoside, Luteolin 7-β-D-glucopyranosid,	Leaves	[54]
2		Galinoside A, Galinoside B, 3,5,3′,5′-tetrahydroxy-7,4′-dimethoxyflavone-3-O-α-Lrhamnopyranosyl-(1→3)-O-α-L-arabinopyranosyl-3′-O-β-D-galactopyranoside, Parviside A , 3,5,7,3′,4′-	Whole plant	[55] [57] [58]

		pentahydroxyflavanone, 7,3′,4′-trihydroxyflavanone		
3		Kaempferol, 3,5,7,8,4′-pentahydroxy-3′-methoxyflavone-3-O-α-Lrhamnopyranosyl-7-O-β-D-glucopyranosyl-(1→4)-O-β-Dxylopyranoside , Quercetin	Stem	[56]
B.4	**Aromatic Esters**	Galinosoate A ,Galinosoate B, Galinosoate C	Whole	[57]
C.5	**Diterpenoids**	ent-15-angeloyloxy-16-kauren-19-oic acid, ent-15-angeloyloxy-16,17-epoxy-19-kauranoic acid, ent-kaur-16-en19-oic acid, Phytol	Whole	[59] [60]
D.6	**Caffeic acid derivatives**	2,3(4,5)-dicaffeoylaltraric acid, 2,3,4,5-tetracaffeoylglucaric acid , 2,3,4-or 3,4,5-tricaffeoylaltraric acid, 2,4,5-tricaffeoylglucaric acid	Aerial	[61]
7		Parviside B	Whole	[58]
E.8	**Steroids**	7-hydroxy-β-sitosterol, 7-hydroxy stigmasterol, β-sitosterol, β-sitosterol-3-O-β-D-glucopyranoside, α-spinasterol, Stigmasterol Gallic	Whole	[59] [60] [62]
F.9	**Phenolic acid derivatives**	3,4- dihydroxy benzoic acid, acid, 4-Hydroxy benzoic acid	Whole	[62]
G.10	**Miscellaneous Compounds**	Fumaric acid, Octacosanoic acid, Ursolic Acid, 3,4-dimethoxycinnamic acid, Triacontanol, Uracil	Whole	[60] [62]

Tradtional uses

The juice of the entire plant is used to treat wounds and injuries on the body, while the roots are a powerful treatment against the bites of beetles [24]. The Traditional medicine uses the aerial parts of *Galinsoga* species in anti-inflammatory medication formulations dermatological conditions such as acne, eczema, and rosacea Eczema and lichens [17]. Because of its high vitamin C 5 content, this plant has been utilised as an anti-scurvy remedy [25]. It is also used to heal cold sores and halt bleeding [26].It is also utilized to treat common cold and flu [27]. The flowers have analgesic qualities and are used to make toothache treatment preparations [28]. It has been claimed that aqueous extracts of the plant's aerial portions protect against UV irradiation-induced damage, and that it's also used to treat wounds and eye problems [29,30].

It is also applied in nutraceuticals, because of optimum levels of calium, magnesium &proteins are present in galinsoga praviflora [31].The young leaves and shoots of *Galinsoga parviflora* are eaten as a vegetable in Zimbabwe, South Africa, and Tanzania [31-32].The fresh leaves of *Galinsoga parviflora* are used for making salad, and the dried whole plant is employed in making soups[31, 33].*Galinsoga parviflora's* dried leaves and juice have also been used to treat haemorrhages and as an analgesic [25].It aids for fresh wound and cut blood [10, 11].

Pharmacology of *Galinsoga*

1) Hypoglycemic activity

Hypoglycemic activity of ethanolic extract from the whole plant of *Galinsoga parviflora*was studied by using *invivo*model.The ethanolic extract at concentration of (400 mg/kg) has high hypoglycemic effect and it is found to be almost identical to the standard glibenclamide 5 mg/kg BW(which is used against TYPE II Diabetes mellitus) as a medication [21].

2)Anti-Microbial activity

a)Antibacterial activity

The antibacterial activity of fractions (methanol, H2O fractions, Ethanol and light petroleum, ethyl acetate fractions)from the stem of*Galinsoga parviflora*was studied by *invitro* model.Theplant have weak antibacterial activity against tested gram positive bacterias except *bacillus subtilis,* and also active against gram negative bacterias such as *M. luteus and S. aureus, E. coli, P. aeruginosa* [34, 17].

b) Antifungal Activity

The antifungal activity of fractions (Ethanol and light petroleum, ethyl acetate fractions,leaf oil)from the whole plant of *Galinsoga Parviflora*was studied by *invitro*model.The plant have strong antifungal activity against *S. aureus and B. cereus, A. niger and C. albicans* [21,35].

c) Nematicidal

The nematicidal activity of 7 pure *Galinsoga parviflora* compounds, along with their crude ethanolic extract fractions (hexane, ethyl acetate, chloroform, and methanol),from the whole plant of *Galinsoga parviflora* was studied by *invitro* model.The plant was evaluated against *Meloidogyne incogniti* and *Cephalobus litoralis* [36].The ethyl acetate fraction produce strong inhibition activity against *Meloidogyne incognita*.The Compounds(β-sitosterol-3-O-β-D-glucopyranoside and Ursolic Acid) were shown to have reactive power against *Cephalobus litoralis*, however compound (4-Hydroxy benzoic acid) was found to have strong activity against both species [23].

Anti oxidant activity

The antioxidant activity of fractions (Ethyl acetate, methanol, H2O fractions) from the whole plant of *Galinsoga parviflora* was studied by *invitro* model.When compared to 0.1 M ascorbic acid, the ethyl acetate fraction exhibit high antioxidant activity at 150 mg/mL.The 20 percentage methanol fraction produce the greatest antioxidant activity against DPPH radicals in studies using methanol extract [21]. The H2O fraction of the methanol extractshows the most activity, with an IC50 value of 6.86 1.31.g/ml which is against linoleic acidperoxidation [16].

Anti scavenging activity

The antiscavenging activity of ethanolic extract from the whole plant of *Galinsoga parviflora* was studied by *invitro* model. The 50 percentage methanol fraction has the highest superoxide scavenging ability, with SC50 value of 30.6 3.1 g/mL[25].

Anti inflammatory activity

The anti-inflammatory activity of the plant *Galinsoga parviflora* was studied by *invitro* model [37]. Theextracts of aerial part of *Galinsoga parviflora* are used to test the anti inflammatory activity by using the cyclooxygenase (COX 1) assay. The extract of Hexane, Methanol and water (500 μg/mL) gives 68.0±4.5 percentage, 90.0±1.5 percentage and 54.0±2.5 percentage of inhibitions against cyclooxygenase [34]. Methanolic extract of*Galinsoga parviflora* (IC50 30.7 μg/mL) exhibit greatest anti-inflammatory activity against 5-lipoxygenase (5-LOX)[38].

Anti cancer activity

The anticancer activity of the plant *Galinsoga parviflora* was studied by using *invitro* model.The total ethanolic extract from the whole plant of *Galinsoga parviflora* shows weak cytotoxic activity against MCF-7 breast cancer cell lines at low concentrations (down to 100 g/mL) [21].At high concentration (1000 μg/mL) it will kill all the cells, as a result, the extract was termed cytocidal rather than cytotoxic [36]. On human proteolytic leukaemia cells two fractions(ethyl acetate and chloroform) of*Galinsoga parviflora*extract were tested for cytotoxic/anti-cancer activity [39].

Hepatoprotective activity

The Hepatoprotective activity of the plant *Galinsoga parviflora* was studied by *invivo* model. The ethanolic extract from the whole plant of *Galinsoga parviflora*at concentration of400mg/kgBW, and standard silymarin (150mg/kgBW) was found to be significantly reducing the level of serum alanine aminotransferase activity [21].

Urease activity

The compounds Galinsoside A & Galinsoside B from whole plant of *Galinsogaparviflora* exhibit strong and moderate inhibitory activities on urease.The urease activity of the plant was studied by the assay,Urea using indophenol method [16].

Alpha glucosidase activity

The chemical compound galinsoside B from the whole plant of *Galinsogaparviflora* has strong inhibitory activity against α-glucosidase enzyme [16].

Anti-Hyaluronidase Activity

The anti-hyaluronidase activity of the plant *Galinsoga parviflora* was conducted by turbidimetric method [40].The hydroalcoholic GP extract (IC50 = 0.47 mg/mL) from the aerial partsof the plant was shown to be more active than the positive control kaempferol (IC50 = 0.78 mg/mL) in the investigation [8, 16, 17, 25, 41].

Anti-arthritic activity

The anti-arthritic efficacy of *Galinsoga parviflora* methanolic extract was studied extensively utilising an

in-vitro suppression of protein denaturation model.The Methanolic Extract from the whole plant of *Galinsoga parviflora* at three different concentrations like 100, 250 and 500 mcg/ml in DMSO (Dimethyl sulphoxide) provided significant protection against protein Denaturation.The majority of researchers have concluded that protein denaturation is one of the causes of rheumatoid arthritis.So, that *Galinsoga parviflora* could be used as potent anti-arthritic agent [42-45].

Anti-platelet activity:

The anti-platelet activity of methanolic extract from the whole plantof *Galinsoga parviflora* was studied by *invitro* model.The methanolic extract of *Galinsoga Parviflora* at concentration of 500 mcg/ml showsignificant anti-platelet activity because as per the study it is highly useful in arterial thrombosis [46, 47].

Conclusion

Galinsoga praviflora belonging to family *Astraceae,*The plant is rich in phytoconstituents so, should be keenely looked and thereby expolorating it's utility in therapeutics & medicine. Various extracts and chemical compounds of the plant have shown antibacterial, antifungal, antioxidant, cytotoxic, anti-inflammatory, urease, α-glucosidase, and hepatoprotective, nematicidal and hypoglycaemic activities. *Galinsoga parviflora* has a vast number of chemicals that have been identified and demonstrated to have a wide range of biological functions. Furthermore, the plant's crude extracts and solvent fractions have been linked to a variety of pharmacological properties. More research on this amazing plant is needed in order to have a more detailed and in-depth understanding of its pharmacological and therapeutic potential.And because of its potent hypoglycemic effect and alpha glucosidase inhibitory properties it can use as a supplementary therapy for diabetic patients.

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