Ethnobotanical and pharmacological profile of *Galinsoga parviflora*

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*Galinsoga parviflora* is a member of the *Astraceae* 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.

**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 biological activities such as Alpha-glucosidase inhibitor & hypoglycemic, Anti Microbial, Anti oxidant, Anti inflammatory, Anti cancer etc [1].

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Pharmacognosy of *Galinsoga praviflora*;

*Figure 1: Galinsoga parviflora view*

**B.S**

*Galinsoga praviflora* is a herbaceous plant belonging to family *Asteraceae* [8].

**Geographical source**

- The hilly region of Central America is thought to be the origin of *Galinsoga parviflora* [4].
- Occurring 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 sparsely hairy achenes.
  - Seeds are 1-1.4 mm long, with a single row of long hairdpappus Leaves 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 70 cm.
- 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>
<thead>
<tr>
<th>Sl No</th>
<th>Chemical compound</th>
<th>Class of compound</th>
<th>Plant part</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1</td>
<td>Flavonoids</td>
<td>Apigenin 7-β-D-glucoside, Luteolin 7-β-D-glucopyranosid,</td>
<td>Leaves</td>
<td>[54]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Galinoside A, Galinoside B, 3,5,3′,5′-tetrahydroxy-7,4′-dimethoxyflavone-3-O-α-Lrhamnopyrorosyl-(1→3)-O-α-L-arabinopyranosyl-3′-O-β-D-galactopyranosid, Parviside A , 3,5,7,3′,4′-</td>
<td>Whole plant</td>
<td>[55] [57] [58]</td>
</tr>
</tbody>
</table>

Table 1: Depict Chemical compounds present in *Galinsoga parviflora*
<table>
<thead>
<tr>
<th>Chemical Compounds</th>
<th>Phenolic acid derivatives</th>
<th>Whole</th>
<th>[62]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F.9</strong></td>
<td>3,4-dihydroxy benzoic acid, acid, 4-Hydroxy benzoic acid</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>G.1</strong></td>
<td>Fumaric acid, Octacosanoic acid, Ursolic Acid, 3,4-dimethoxy cinnamic acid, Triacantanol, Uracil</td>
<td></td>
<td></td>
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<tr>
<td><strong>B.4</strong></td>
<td></td>
<td>Whole</td>
<td>[57]</td>
</tr>
<tr>
<td><strong>Aromatic Esters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galinsoside A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galinsoside B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galinsoside C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C.5</strong></td>
<td></td>
<td>Whole</td>
<td>[59]</td>
</tr>
<tr>
<td><strong>D.6</strong></td>
<td>2,3(4,5)-dicaffeoylaltraric acid, 2,3,4,5-tetra caffeoylglutaric acid, 2,3,4-or 3,4,5-tricaffeoylaltraric acid, 2,4,5-tricaffeoylglu taric acid</td>
<td></td>
<td>[61]</td>
</tr>
<tr>
<td><strong>E.8</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steroids</td>
<td>7-hydroxy-β-sitosterol, 7-hydroxy stigmasterol, β-sitosterol, β-sitosterol-3-O-β-D-glucopyranoside, α-spinasterol, Stigmasterol Gallic</td>
<td>Whole</td>
<td>[59]</td>
</tr>
</tbody>
</table>

**Traditional 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 calcium, 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 *in vivo* 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 *in vitro* model. The plant has weak antibacterial activity against tested gram positive bacteria except *bacillus subtilis*, and also active against gram negative bacteria 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 *in vitro* model. The plant has 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 *in vitro* model. The plant was evaluated against *Meloidogyne incogniti* and *Cephalobus litoralis* [36]. The ethyl acetate fraction produces 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 *in vitro* model. When compared to 0.1 M ascorbic acid, the ethyl acetate fraction exhibits high antioxidant activity at 150 mg/mL. The 20 percent methanol fraction produces the greatest antioxidant activity against DPPH radicals in studies using methanol extract [21]. The H2O fraction of the methanol extract shows the most activity, with an IC50 value of 6.86 1.31 g/mL which is against linoleic acid peroxidation [16].

Anti-scavenging activity

The anti-scavenging activity of ethanolic extract from the whole plant of *Galinsoga parviflora* was studied by *in vitro* model. The 50 percent 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 *in vitro* model [37]. They extracts 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) exhibits the 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 *in vitro* 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 cytotoxic 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 *in vivo* model. The ethanolic extract from the whole plant of *Galinsoga parviflora* at concentration of 400 mg/kg BW, and standard silymarin (150 mg/kg BW) 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 *Galinsosaparviflora* 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 *Galinsosaparviflora* 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 part of 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 International Journal of Health Care and Biological Sciences
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 plant of Galinsoga parviflora was studied by invitro model. The methanolic extract of Galinsoga Parviflora at concentration of 500 mcg/ml shows significant anti-platelet activity because as per the study it is highly useful in arterial thrombosis [46, 47].

Conclusion
Galinsoga praviflora belonging to family Asturceae; The plant is rich in phytoconstituents so, should be keenly looked and thereby exploring 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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