Review on *Glycyrrhiza glabra* L. (*Aṣl al-Sūs*) with Unani Perspective and Modern Pharmacology

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**ABSTRACT**

Traditional Unani (Greco-Arab) medicine is among the most ancient therapies founded by the father of Western medicine, the Hippocrates. Presently, most of the population worldwide depend on herbal medicines for some aspect of their primary health care needs. Treatment with medicinal plants is appraised very safely as there are no or minimal side effects. The promising fact is that herbal treatment can be used irrespective of any age group. Most of the pharmaceutical companies are currently conducting extensive research on plant materials assemble from the rain forests and other places for their potential medicinal value. *Glycyrrhiza glabra* L. (Leguminosae/Fabaceae) is best known for its use in making licorice-flavored confectionery. In Unani medicine, it is commonly known as *Aṣl al-Sūs*. It is a plant of remote origin. *Aṣl al-Sūs* extracts and its principle element “glycyrrhizin” have widely been used in foods, tobacco and for medicinal purposes in herbal and traditional medicines as well. It possesses multiple pharmacological and medicinal activities such as anti-ulcer, anti-inflammatory, anti-viral, and hepatoprotective actions. This review attempts to compile the data regarding its ethnobotanical actions and medicinal uses in Unani medicine along with its phyto-pharmacological descriptions.

**Keywords:** Herbal medicine, *Aṣl al-Sūs*, *Glycyrrhiza glabra* L.

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**Introduction**

The herbal products have extensively been used for the thousands of years for amelioration of human sufferings both in the developed and developing countries due to their natural origin and lesser side effects[1]. Even today, when the acceptance of conventional medicine is on its peak corroborated with scientific evidences, the traditional herbal treatment holds the sway among the masses due to its negligible untoward effects, effectiveness in management of chronic morbidities, lower cost, and widespread availability[2]. With the persistent demand and use of herbal medicines by the patients in various ailments, various countries have come out with political commitment and technical support for the evolution and propagation of indigenous medicines[3]. This overwhelming support may be attributed to the development of advanced technologies for verification of phytochemical and pharmacological actions of plants in numerous pathological conditions[2].

Unani system of medicine is an ancient traditional medicine founded almost 2500 years ago in islands of Cos, Greece on the hands of Hippocrates[4]. The uniqueness of this system is the individualistic but holistic approach in disease prevention and management[5].

*Aṣl al-Sūs* is a popular herbal drug of Unani medicine. Its botanical name is *Glycyrrhiza glabra* L. of the Fabaceae family. The common names are licorice and sweet wood. Its root (*Bikh-i-Aṣl al-Sūs*) and extract (*Rub al-soos*) are widely used for the treatment of various diseases[6,7].

According to *Ibn Baitar*, *Aṣl al-Sūs* is the drug of choice for respiratory and bladder diseases, such as burning.
micritation and burning sensation in the chest. It is also used in treatment of cold tempered ailments; Amrāt-i Balghamiyah and Sawdāwi (pneumatic and melancholic disorders), such as Sar (epilepsy), Fālī (hemiplegia), Laqva (facial palsy), Qābās (nightmare), Tawabhush (anxiety), Mālikhūlia (Melancholia), Khushnaut-i Halq (sore throat), Bōbat al-Sawt Ḥād (acute hoarseness of voice), Warm-i Luhāt (unvalitis), Warm-i Sho'ba al-Riyā (bronchitis), Diq al-Nafjes (asthma), Sū'at-i Yābis (dry cough) etc[7-13]. Asl al-Sūs has experimentally been proved for various pharmacological actions, such as anti-bacterial, anti-hepatotoxic, anti-fungal, and anti-oxidant; anti-hyperglycemic, anti-viral, anti-ulcer, estrogenic, anti-diuretic, and immuno-stimulant activities. It has also been found effective in cure of psoriasis, eczema, and herpes simplex[14,15].

The important chemical constituents are flavonoids, coumarins, volatile oils, terpenoids, and amino acids which have been isolated from the plant root[6,8,16]. However, the reported adverse effects are liver, spleen and kidney derangements. In Unani medicine, its roots are used only after peeling the bark (Asl al-Sūs. Muqash’shar) which dramatically decreases its toxic effects.

**Scientific classification**[17]

Kingdom: Plantae  
Subkingdom: Tracheobionta  
Division: Magnoliophyta  
Class: Magnoliopsida  
Subclass: Rosidae  
Order: Fabales  
Family: Fabaceae  
Genus: Glycyrrhiza  
Species: G. glabra  
Botanical name: *Glycyrrhiza glabra* L.

**Vernacular names:** [6,7,9,10,16,18]

**Arabic:** Aṣl al-Sūs; Irq al-sūs; Ood al-sūs; ‘Uruq al-soos  
**English:** Licorice; Liquorice root; Sweet wood  
**French:** Bois doux  
**German:** Sussholz  
**Greek:** Glycyrrhiza  
**Hindi:** Mulethi; Mulathi; Muleti; Jethimadhu; Jethimadhu; Mulhatti  
**Kannada:** Atimadhura; Yeshtimadhuka  
**Kashmiri:** Multhi; Shanger  
**Malayalam:** Athimadhuram; Lrattimadhuram; Yeshtimadhuram  
**Marathi:** Jeshthamadh  
**Oriya:** Jastimadhu; Jatimadhuh  
**Persian:** Bikh-i-Mehak; Bikh-i-Ribas; ‘Usara-mehak  
**Punjabi:** Jethimadhu; Mulathi  
**Sanskrit:** Madhula; Yastimadhuma; Sinhale: Welmi  
**Tamil:** Athimadhuram; Antimadhuram  
**Telugu:** Atimadhuramu; Yashhtimadhukam  
**Urdu:** Mulethi

*Dioscorides* is credited for coining the name *Glycyrrhiza* which is composed of two Greek words implying sweet root. The specific name glabra indicates its smooth surface without hairs.

**Distribution:** The plant is native to the Mediterranean region; it is cultivated in Iran, Afghanistan, and Europe. No liquorice yielding species is found in India; although, the cultivation of *G. glabra* has been undertaken at several places on an experimental basis such as Baramulla; Srinagar; Delhi; Dehradun; and hilly areas of South India[6,8,19,19].

**Description in Unani Literatures:** Asl-ul-soos is a dried, unpeeled or peeled root and shoot of *Glycyrrhiza glabra* L. of *Leguminosae* family. It extends up to 2-meter height; flowers vermilion blue; leaves mimic with Kasondi (*Cassia occidentalis*); small legumes arise on the branches which carry 4-5 seeds; roots spread 1 meter in soil; smell unclear and unique; taste sweet then bitter[17,18].

**Morphology**

**Macroscopic**

**Root:** Cylindrical root pieces,14-20 cm in length, 5-20 cm in width, surface irregular, longitudinally wrinkled, at places shows scars left by removal of the lateral roots; fracture outer fibrous and inner splintery; externally dark brown; internally golden yellow; transversally cut surface exhibits wide central xylem, cambium ring, outer narrow phloem, and wide radiating medullary rays. Taste is sweet; odor is unclear and unique[6,8,20].

**Stolon:** Cylindrical, unbranched, straight, variable in length, 1-2 cm in diameter; it consists of yellowish brown or dark brown outer layer; externally longitudinal wrinkled with occasional small buds and encrcling scale leaves; smoothened transversely; the cut surface shows a cambium ring about one-third of radius from outer surface and a small central pith[6,8,20].

**Microscopic**

**Stolon:** Transverse section of stolon shows cork of 10-20 or more layer of tabular cells, outer layers with reddish-brown amorphous contents, Inner 3 or 4 rows having thicker; colorless walls; secondary cortex usually of 1-3 layers of radially arranged parenchymatous cells containing isolated prism of calcium oxalate; 2° phloem a broad band; cells of inner part cellulosic and outer lignified; radially arranged group of about 10-50 fibers surrounded by a sheath of parenchyma cells, each usually containing a prism of calcium oxalate about 10-35 μm long cambium form tissue of 3 or more layers of cells; secondary xylem distinctly radiate with medullary rays,3-5 cells wide; vessels about 80-200μm in diameter with thick, yellow, pitted, reticulately thickened walls; groups of lignified fibers with crystal sheath similar to those of phloem; xylem parenchyma of two kinds, those between vessels having thick pitted walls without intercellular spaces, the remaining with thin walls pith of parenchymatous cell in longitudinal rows, with intercellular spaces[6,8,20].

**Root:** Transverse section of root shows structure closely resembling to that stolon except that no medulla is present; xylem tetrarch; usually principal medullary rays are at right angles to each other; in peeled drug cork shows phellderm and sometimes without secondary phloem; all parenchymatous tissues containing abundant, simple, oval or rounded starch grains that are 2-20μm in length[6,8,20].

**Phytochemical Constituents**[6,8,16,18]

- Amino acids
- Asparagine
- Bitters
- Coumarin
Essential oil
Female hormone estrogen
Fat
Flavonoids
Glycosides
Glycyrrhizin (main constituent found in the root)
Gums
Glycyrrhetic acid
Mucilage (rhizome)
Protein
Resin
Saponoids
Sterols
Starches (30%)
Sugars (up to 14%) when mixed with water or used in cough drops
Tannin
Volatile oil.

Pharmacokinetic studies

After oral administration of licorice in humans, the main constituent glycyrrhizic acid is hydrolyzed into glycyrrhetic acid by intestinal bacteria possessing a specialized β-glucuronidase[21,22]. Glycyrrhetic acid is 200-1,000 times more powerful inhibitor of 11-β-hydroxy-steroid dehydrogenase involved in corticosteroid metabolism than glycyrrhizinic acid. Hence, its pharmacokinetic behavior after oral intake is too appropriate. After oral dosing, glycyrrhizic acid is promptly absorbed and transported through carrier molecules to the liver, and metabolized into glucuronide and sulfate conjugates, which are eventually hydrolyzed to glycyrrhetic acid. Glycyrrhetic acid is then reabsorbed, resulting in an important hamper in terminal clearance from plasma[23]. After oral administration of 100 mg glycyrrhizin in healthy volunteers, no glycyrrhizin was found in the plasma but glycyrrhetinic acid was found at < 200 ng/mL[23]. In the 24-hour period after oral administration, glycyrrhizin was observed in the urine which indicates that it is partly absorbed as an intact molecule[24].

Mechanism of Action: Glycyrrhizin and glycyrrhetic acid are derived from Glycyrrhiza glabra have been found for suppressing development of various infections including hepatitis A and C; HIV; herpes zoster; CMV, and Herpes simplex[25,26]. Glycyrrhizin and its metabolites are reported to suppress the aldosterone and smother 5 β reductase in pseudo-aldosterone disorder. The similarity in the structure of glycyrrhetic acid to the structure of hormones discharged by the adrenal cortex highlights the mineralocorticoid and glucocorticoid action of glycyrrhizin corrosive[27,28].

Mizāj (temperament): Unani scholars have differed in identification of its temperament as under:
- Hot and dry[9]
- Ibn Sina and Kirmānī considered it moderate or Murakkab-ul-Qawa
- Some regarded it hot10 and wet11[29]
- Hot 2 and dry 19[9]

Parts used: root[29]

Dose:: 3-7 gm[9] ; 5-10 gm[30]

Adverse effects: it may cause or aggravate diseases of liver, kidney, and spleen[10,30,31]

Corrective: Gul-e-Surkh (Rosa demascena) in case of splenic toxicity; Samagh-i-Katira (Gum Traga cantha) in diseases of kidney[8,30].

Substitute:[10,30]
- Rubb-al-sūs (extract of root of Glycyrrhiza glabra L.)
- Turbud (Ipomoea terphtum)
- Zanjabil (Zingiber officinale)
- Khulanjan (Alpinia galanga)
- In case of headache, Samagh-i-Katira (Gum Traga cantha) is used as substitute.

Pharmacological actions of Glycyrrhiza glabra L. (Ašl al-Sūs.) in Unani medicine and Ethno-medicine

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Action</th>
<th>Unani Reference</th>
<th>Ethno-botanical Reference</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Resolvent (Muḥallīl-i-Warm)</td>
<td>[8,30]</td>
<td>[22]</td>
</tr>
<tr>
<td>2.</td>
<td>Demulcent (Mulatīj)</td>
<td>[8,19]</td>
<td>[17,23]</td>
</tr>
<tr>
<td>3.</td>
<td>Expectorant (Muṇaffīj-i-Balgham)</td>
<td>[8,17]</td>
<td>[34]</td>
</tr>
<tr>
<td>4.</td>
<td>Detergent (Jālī)</td>
<td>[8,10]</td>
<td>[35]</td>
</tr>
<tr>
<td>5.</td>
<td>Carminative (Kasīr-i-Riyāḥ)</td>
<td>[8,36]</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Nervine tonic (Maqawwī-i-Asab)</td>
<td>[8,17,36]</td>
<td>[34]</td>
</tr>
<tr>
<td>7.</td>
<td>Emmenagogue (Muddir-i-hayd)</td>
<td>[8,17,29]</td>
<td>[34]</td>
</tr>
<tr>
<td>8.</td>
<td>Laxative (Mulāyīn)</td>
<td>[36]</td>
<td>[17]</td>
</tr>
<tr>
<td>9.</td>
<td>Diuretic (Muddir-i-bawl)</td>
<td>[8,10,36]</td>
<td>[35]</td>
</tr>
<tr>
<td>10.</td>
<td>Antipyretic (Daf-i-Hummā)</td>
<td>[8,10]</td>
<td></td>
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<tr>
<td>11.</td>
<td>Anti-anxiety (Daf-i-Tawbahsh),</td>
<td>[10]</td>
<td></td>
</tr>
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<td>12.</td>
<td>Emollient</td>
<td></td>
<td>[37]</td>
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</tbody>
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Therapeutic uses in Unani and Ethno-medicine

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Uses</th>
<th>Unani reference</th>
<th>Ethno botanical references</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Gastric ulcers (Qarba-i-mi’dā)</td>
<td>[11,12]</td>
<td>[38]</td>
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<tr>
<td>2.</td>
<td>Duodenal ulcers (Qarba-i-Ashnā-i-Ashri)</td>
<td>[11,12]</td>
<td>[38]</td>
</tr>
<tr>
<td>3.</td>
<td>Sore throat (Khashānat al-Halē)</td>
<td>[8,12]</td>
<td>[39]</td>
</tr>
<tr>
<td>4.</td>
<td>Bronchitis (Warm-i-Sho’ba’al-Rīyya)</td>
<td>[8,12]</td>
<td>[39]</td>
</tr>
<tr>
<td>5.</td>
<td>Asthma (Dīq al-Nafas)</td>
<td>[7,9,10]</td>
<td>[39]</td>
</tr>
<tr>
<td>6.</td>
<td>Rheumatoid Arthritis (Waj al Mafaṣīl)</td>
<td></td>
<td>[60]</td>
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<tr>
<td>7.</td>
<td>acute hoarseness of voice (Bubha-al-Sawth)</td>
<td>[7,9,10]</td>
<td>[41]</td>
</tr>
<tr>
<td>8.</td>
<td>Dry cough (Suāl-i-yābis)</td>
<td>[13]</td>
<td>[40]</td>
</tr>
<tr>
<td>9.</td>
<td>Epilepsy (Su’r)</td>
<td>[7,9,10]</td>
<td>[34]</td>
</tr>
<tr>
<td>10.</td>
<td>Hemiplegia (Fālūj)</td>
<td>[7,9,10]</td>
<td></td>
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<tr>
<td>11.</td>
<td>Facial palsy (Laqwa)</td>
<td>[12,13]</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Nightmare (Qābūs)</td>
<td>[12,13]</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Anxiety (Toawahbush)</td>
<td>[7,10,13]</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Melanocholia (Malānkḥāliya)</td>
<td>[9,12]</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Hemorrhoids (Bawāsīr)</td>
<td>[7]</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Burning micturition (Hurqa al-bawl)</td>
<td>[7,9,10]</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Uvulitis (Warm-i-luhār)</td>
<td>[7,9,13]</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Stomatitis (Qulā’)</td>
<td>[7,9,10]</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Gonorrhea (Suzāk)</td>
<td>[12,13]</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Abdominal pain (Waja al-mi’dā)</td>
<td>[9,12]</td>
<td>[34]</td>
</tr>
<tr>
<td>21.</td>
<td>Hypertension (Zaghuddam Qawi)</td>
<td></td>
<td>[42]</td>
</tr>
<tr>
<td>22.</td>
<td>Foul perspiration of the armpit</td>
<td>[7]</td>
<td>[24]</td>
</tr>
</tbody>
</table>

Pharmacological evidence/ experimental studies

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Activity</th>
<th>Part/Extract</th>
<th>Cell lines/Animal model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Anti-inflammatory</td>
<td>Hydroalcoholic extract</td>
<td>Carrageenan induced rat paw edema at dose levels of 100,200,300 mg/Kg. The extract showed a maximum of 46.86% inhibitory action [43].</td>
</tr>
<tr>
<td>2.</td>
<td>Immunomodulatory</td>
<td>Aqueous extract</td>
<td>In vitro phagocytosis, determination of cellular immune response hemagglutination antibody titer &amp; plaque forming cell assay using sheep RBCs [44].</td>
</tr>
<tr>
<td>3.</td>
<td>Antiulcer</td>
<td>Aqueous, acetone, ethanolic extracts of leaves</td>
<td>Micro-organism used: Helicobacter pylori by agar well diffusion method [45].</td>
</tr>
<tr>
<td>4.</td>
<td>Anti-tussive</td>
<td>Ethanol extract</td>
<td>SO2 gas induced cough in experimental animals. Mice showed an inhibition of 35.62% in cough on treatment with G. glabra extract [46].</td>
</tr>
<tr>
<td>5.</td>
<td>Chronic fatigue stress</td>
<td>Hydroalcoholic extract</td>
<td>The extract showed the protective effect on mice on exposure to chronic fatigue stress [47].</td>
</tr>
<tr>
<td>6.</td>
<td>Antimicrobial</td>
<td>Ether, Chloroform, acetone</td>
<td>Micro-organisms used: E. coli, B. subtilis, P. aerogenosa, S. aureus [48].</td>
</tr>
<tr>
<td>7.</td>
<td>Cytotoxic</td>
<td>CHCl₃, methanol &amp; aqueous extract</td>
<td>In vitro cytotoxic activity using two different cell lines MCFT-cancerous &amp; Vero-normal cell line [49].</td>
</tr>
<tr>
<td>8.</td>
<td>Anticonvulsant</td>
<td>methanol extract of leaves</td>
<td>Fractions were evaluated intra-peritoneally in mice using maximal electroshock (MES) &amp; pentylenetetrazol (PTZ) seizure tests [50].</td>
</tr>
<tr>
<td>9.</td>
<td>Antiviral</td>
<td>Aqueous extract</td>
<td>Herpes simplex 1 &amp; vesicular stomatitis virus [51].</td>
</tr>
<tr>
<td>10.</td>
<td>Anticancer</td>
<td>Licorice extract</td>
<td>Ames test, Trp-p-1, Trp-p-2 in Staphylococcus TA 98 revertants [52].</td>
</tr>
<tr>
<td>11.</td>
<td>Enzyme inhibiting</td>
<td>Methanolic extract</td>
<td>In-vitro inhibition of tyrosinase enzyme [53].</td>
</tr>
<tr>
<td>12.</td>
<td>Hepatoprotective</td>
<td>Aqueous extract of roots</td>
<td>PCM induced rats’ hepatocytes damage in vivo. Rabbit models with acute liver injury induced by CCl₄ [54].</td>
</tr>
<tr>
<td>13.</td>
<td>Memory enhancing</td>
<td>Aqueous extract of roots</td>
<td>Three-month-old Wistar albino rats. Elevated -plus maze and Morris water –maze test were conducted [55].</td>
</tr>
<tr>
<td>14.</td>
<td>Antioxidant</td>
<td>Methanol extract</td>
<td>The method based on scavenging activity &amp; reduction capability of 1,1-diphenyl-2-picrylhydrazyl radical; Also against nitric oxide &amp; superoxide radicals [56].</td>
</tr>
<tr>
<td>15.</td>
<td>Anti-stress activity</td>
<td>Alcoholic &amp; aqueous extract</td>
<td>Reduce stress in Drosophila melanogaster induced by Methotrexate at different concentrations [57].</td>
</tr>
</tbody>
</table>
**Compound formulations:** Various compound formulations have been mentioned in Unani medicine containing *Aṣl al-Sūs*, and these compounds are:

- Dayaqua; Ḥabb-i-Baqqa; Ḥabb-i-Sā’al Musakkin; Ḥabb-i-i-Gharīqun; Ḥabb-i-Nazla; Ḥabb-i-Surfa Qaww; Jawarish Aṣl al-sūs; Joshandah Munzij; Lauq Sapistan; Lauq Amaltas; Lauq Khīyar Shmabar; Lauq Sapistan; Lauq Shamoon; Lauq Halba; Lauq Ziq-un-Nafṣ; Majun Mughalliz Jawaharwali; Majun Mundi; Marham Kafoor; Namak Sulemani; Qabzeen; Qurs-i-Gul; Qurs-i-Sū’al; Qairūtī Aarad Karsana; Quṣr-i-Mullayyin; Quṣr-i-Sārṭan Kafoor; Quṣr-i-Zarishk; Roghan Sanan; Satawari; Sharbat Saddar; Sharbat Aījāz[58–66]

**Conclusion:**

*Aṣl al-Sūs* is one of the most important plant *Glycyrrhiza glabra* L. (*Leguminosae/Fabaceae*) which has been used by Unani physicians for the treatment of various diseases. The modern experimental and clinical pharmacological studies confirmed also anti-inflammatory, immuno-modulatory, anti-ticuic, anticonvulsant, memory-enhancing activities etc.

From this evidence-based review it can be concluded that new research avenues may validate scientifically the use of *Glycyrrhiza glabra* L. in amelioration of various diseases as described by Unani scholars.

**References:**


