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Asl-us-Sus (*Glycyrrhiza glabra* L.) –A Potent Unani Drug

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ABSTRACT

The use of herbal drugs is as old as human beings. *Asl-us-Sus* (*Glycyrrhiza glabra* L.) is a leguminous herb belongs to the family Fabaceae, and is also known as *Mulethi* or Liquorice. The plant is found world widely. From Unani classical literature, it is evident that *Asl-us-Sus* has been used for its *Mundij-i-balgham* (concoctive of phlegm) property to evacuate *fasid madda* (morbid matters) produced due to excess or putrefaction of phlegm which causes many diseases like, epilepsy, hemiplegia, facial palsy, anxiety, sore throat, acute hoarseness of voice, uvulitis, Bronchial asthma, bronchitis, burning micturition, gonorrhoea etc. In recent times a lot of scientific studies have been performed on *Asl-us-Sus* namely phyto-chemical, physicochemical, pharmacological studies. In this paper, an effort has been made to collect information on medicinal properties of *Asl-us-Sus* mentioned in Unani classical literature as well as those which have been validated in the light of recent scientific studies.

KEYWORDS: *Asl-us-Sus*, *Glycyrrhiza glabra* L., *Mundij-i-balgham*, Unani

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INTRODUCTION

The medicinal plants are being therapeutically exploited throughout the world for treating various ailments, and it is the oldest and the safest method to manage or cure illness. The use of herbal drugs is as old as human beings.

Asl-us-Sus is one of the most famous drugs of Unani medicine which belongs to Fabaceae family. Its root (*Beekh-e-Asl-us-Sus*) and extract (*Rub-al-Sus*) are widely used medicinally especially in the treatment of *Amrāz-i-balghamiyā* (diseases due to phlegm) such as *Sar'* (epilepsy), *Fālij* (hemiplegia), *Laqwa* (facial palsy), *Qabus* (nightmare), *Mālikholia* (Melancholia), *Khushunat-i-Halaq* (sore throat), *Buḥḥa al-Ṣawt ḥād* (acute hoarseness of voice), *Warm-i-luhāt* (uvulitis), *Warm-i-Sho'ba al-riyā* (bronchitis), *Diq al-nafs* (asthma) and *Su'āl-i-yābis* (dry cough) etc. The chemical constituents isolated from the plant are mainly coumarins, flavonoids, terpenoids, volatile oils and amino acids etc. Due to the sweet taste and demulcent property, it is largely used in manufacture of syrup to reduce the bitter taste of medicines.

SCIENTIFIC CLASSIFICATION²

| | |
|---------------|---------------|
| Kingdom | Planta |
| Subkingdom | Tracheobionta |
| Superdivision | Spermatophyta |
| Division | Magnoliophyta |
| Class | Magnoliopsida |
| Subclass | Rosidae |
| Order | Fabeles |
| Family | Fabaceae |
| Genus | Glycyrrhiza |
| Species | G. glabra |

VERNACULARS^{2, 4, 5, 6, 7, 8}

| | |
|----------|-----------------------------------------------------------------------|
| Arabic | Asl-us-Sus, Irq al-Sus, Ood al Sus, 'Uruq al-Sus |
| Assamese | Jesthimadhu, yeshtamadhu |
| Bengali | Jeshtimadhu, jaishbomadhu |
| English | Licorice, liquorice root, sweetwood |
| Gujarati | Jethimadha |
| Hindi | Mulethi, mulathi, muleti, jethimadhu, jethimadh, mulhatti, mithilakdi |
| Kannada | Atimadhura, yeshtimadhuka |
| Persian | Bikh-i-Mehak, bikh-i-ribas, 'usara mehak |
| Punjabi | Jethimadh, Mulathi |
| Sanskrit | Madhuka, yashtimadhu |
| Urdu | Mulethi |

HABITAT AND DISTRIBUTION

The plant is Native to the Mediterranean regions, cultivated in Europe, Persia, and Afghanistan. None of the liquorice yielding species occurs in India but cultivation of *Glycyrrhiza glabra* L. on an experimental scale has been under taken in several places, notably Baramulla, Srinagar in Jammu and Kashmir, Dehradun, Delhi and also in the hilly areas of South India.^{1, 2, 3, 4}

ETHNO-PHARMACOLOGICAL DESCRIPTION

According to the Unani classical literature, *Asl-us-Sus* consists of dried, peeled or unpeeled, root and stolon of *Glycyrrhiza glabra* L. It reaches up to the two meter high; flowers scarlet blue; leaves resembles with Kasondi (*Cassia occidentalis*); small legumes appear on the branches which bear 4-5 seeds; roots spread one meter in soil; smell faint and characteristic; taste sweet then bitter, unpeeled pieces are yellowish brown or dark brown, outer layer longitudinally wrinkled and whitish yellow in depth, peeled pieces are smooth and yellow; the fracture is fibrous in the bark and splintery in the wood. In Indian market it is available in unpeeled form but Russian liquorice is imported in peeled form.^{1,4, 6, 7}

Specimen of unpeeled roots is shown in figure 1.



Fig. 1 *Asl-us-Sus* Roots

BOTANICAL DESCRIPTION

Macroscopic

The raw drug *Asl-us-Sus* is characterized by being nearly cylindrical, the upper portion is more or less knotty; segments are from 14-20 cm in length and from 5 to 20 cm in diameter. The outer surface is yellowish brown or dark brown in colour, longitudinally wrinkled with patches of cork, adhering which are prominent thicker rhizomes, the thinner rhizomes often show the presence of alternate buds. Fracture coarsely fibrous; internal colour is yellow and wood radiate centre occupied by small pith. Odour distinctive; taste sweetish and slightly acid.^{4,5}

Microscopic

The roots are characterized by the presence of several layers of cork cells with reddish brown contents, the inner 3 or 4 layers have thicker colourless wall, the phellogen cells are found to be collapsed in commercial samples of roots. The phelloderms consist of usually 1-3 layers of radially arranged parenchymatous cells and contain isolated prisms of calcium oxalate. The secondary phloem is a broad band parenchymatous medullary rays. The phloem fibres have walls cellulosic in the inner portion lignified on the outer part and radially arranged in groups of prisms of calcium oxalate. The xylem structure in young roots closely resembles tetrarch and it shows absence of pith. Usually four principal medullary rays are present in the young roots. In older roots, secondary thickening of the root is quite characteristic.^{4,5}

PART USED MEDICINALLY

Roots⁸

TEMPERAMENT (*MIZAJ*)

Hot and dry⁸

Hot 2° and dry 1°⁷

DOSAGE

3-7 gm⁸

5-10gm¹³

TOXICITY (MUZIR)

Harmful when used in diseases of kidney, liver and spleen^{7, 12, 13}

CORRECTIVE (MUSLEH)

- Gul-e-Surkh (*Rosa damscena*)
- Samagh-i-Katira (*Gum tragacantha*)
- Unnab^{7, 13}

SUBSTITUTE (BADAL)

- Rubb-us-Sus (extract of *Glycyrrhiza glabra*-made from the extract of the root of *G. glabra*)
- Turbud (*Ipomoea terpehum*)
- Zanjabeel (*Zingiber officinale*)
- Khulanjan (*Alpinia galanga*)
- Samagh-i-Katira (*Gum tragacantha*) in case of headache^{8, 13}

COMPOUND FORMULATIONS

Dayaquza, Habb-i-Ghariqun, Habb-i-baqila, Habb-i-Nazla, Habb-i-Su'al Musakkin, Habb-i-Surfa, Habb-i-Surfa Qawi; Jawarish asl us sus; Lauq amaltas, Lauq Hulba, Lauq Khiyar Shmabar, Lauq Nazli, Lauq Sapistan, Lauq Shamoona, Lauq Ziqun Nafas, Majun Mughalliz Jawaharwali, Majun Mundi, Marham Kafoor, Namak Sulemani, Qabzeen, Qairuti Aarad Karsana, Qurs-i-Gul, Qurs-i-Mullayyin, Qurs-i-Su'al, Qurs-i-Sartan-Kafoori, Qurs-i-Zarishk, Roghan Sanan, Satawari, Sharbat Sadar, Sharbat Aijaz.^{14, 15, 16, 17}

PHARMACOLOGICAL ACTIONS

- *Munzdiq-e-Balgham* (Concoctive of phlegm)
- *Mulaṭṭif*(Demulcent)
- *Jāli*(Detergent)
- *Muqawwi-e-Ā'sāb*(Nervine tonic)
- *Mugharri*(Mucilaginous)
- *Muḥallil-e-Warm*(Anti-inflammatory)
- *Munaffith-e-Balgham*(Expectorant)

- *Kāsir-e-Reyāh* (Carminative)
- *Daf-e-Humuḍat-e-Mi'da*(Antacid)
- *Mudirr-e-Bawl*(Diuretic)
- *Muddirr-e-ḥayḍ*(Emmenagogue)
- *Muqawwi-e-Dimāgh* (Brain tonic)
- *Muqawwi-e-Bāh*(Aphrodisiac)
- *Mulayyin* (Laxative)
- *Musakkin*(Sedative)
- *Musakkin 'utāsh* (sedative of thirst)
- *Daf-i-ḥummā* (Antipyretic)
- *Daf-i-Tawahḥush*(Anti-anxiety)^{1,8}

THERAPEUTIC USES

- *Sar'*(Epilepsy)
- *Fālij* (Hemiplegia)
- *Laqwa* (Facial palsy)
- *Qābūs* (Nightmare)
- *Tawahḥush* (Anxiety)
- *Mālikholiā* (Melancholia)
- *Khushūnā al-Ḥalaq* (Sore throat)
- *Buḥḥa al-Ṣawṭ ḥād* (Acute hoarseness of voice)
- *Warm-i-luhāt* (Uvulitis)
- *Ḍiq al-Nafas* (Asthma)
- *Warm-i-Sho'ba al-riyā* (Bronchitis)
- *Suāl-i-yābis* (Dry cough)
- *Qulā'* (Stomatitis)
- *Ḥurqa al-bawl* (Burning micturition)
- *Suzāk* (Gonorrhoea)
- *Sozish-i-bawl* (Urinary tract infections)
- *Waja al-mi'da* (Abdominal pain)
- *Qarḥa-i-mi'da* (Gastric ulcers)
- *Qarḥa-i-Ashnā-i-Ashri* (Duodenal ulcers)
- *Warm-i-Mi'da* (Gastritis)

- *Bawāsir* (haemorrhoides) ^{1, 6, 7, 8, 9, 10, 11}

PHYTOCHEMICAL CONSTITUENTS

The main chemical constituents of *Asl-us-Sus* (*Glycyrrhiza glabra*L.) are coumarins (glycyrin, heniarin, liqcoumarin, umbelliferone, GU-7); flavonoids (flavonols and isoflavones including formononetin, glyzarin, glabrone, glabrin, glabrol, glabridin, glycyrol, and derivatives, kumatakenin, licoflavonol, licoisoflavanone, licoisoflavones A and B, licoricone, liquiritin and derivatives, phaseollinisoflavan; neo-licuroside, chalcones including isoliquiritigenin, licuraside, echinatin, licochalcones A and B; terpenoids (glycyrrhizin glycoside also known as glycyrrhizinic acid or glycyrrhizic yielding glycyrrhetic (orglycyrrhetic) acid and glucuronic acid following hydrolysis; glabrolide, glycyrrhetol, liquiritic acid, licoric acid, and b-amyrin); volatile oils (more than 80 components of volatile oils are identified including anethole, eugenol, benzaldehyde, oestragole, butyrolactone, cumic alcohol, fenchone, propionic acid, furfuryl alcohol, linalool, hexanol, gnonalactone, indole, a-terpineol and thujone). Other active constituents of liquorice include isoflavonoids, amino acids, chalcones, sterols, lignans, amines, gums, asparagine, sugar, wax, resin and starch etc. in addition, it contains phytosterol and oestrogen, the female sex hormone. The yellow colour is due to the anthoxanthin glycoside ^{1, 2, 4, 5}

PHYSICOCHEMICAL STANDARDS¹⁹

Various physicochemical standards of *Asl-us-Sus* are given below:

| | |
|--------------------------------|---------------------|
| pH of 1% aq soln | 5.8 |
| pH of 10% aq soln | 5.8 |
| Loss on drying at 105°C | 7.94% |
| Foreign matter | Not more than 2% |
| Total ash | Not more than 4.80% |
| Acid insoluble ash | Not more than 0.25% |
| Alcohol soluble extractive | Not less than 10% |
| Water soluble extractive | Not less than 20% |

PHARMACOLOGICAL STUDIES

Antitussive and expectorant The liquorice powder and extract was found to be useful for the treatment of sore throat, cough and bronchial catarrh. It is antitussive and expectorant loosening and helping to expel congestion in the upper respiratory tract as it accelerates tracheal mucus secretion²⁰. The demulcent action is attributed to glycyrrhizin. It has been recently found that Liquiritin apioside is an active compound present in the methanolic extract of liquorice. The

compound inhibits capsaicin- induced cough²¹ Antitussive and expectorant The liquorice powder and extract was found to be useful for the treatment of sore throat, cough and bronchial catarrh. It is antitussive and expectorant loosening and helping to expel congestion in the upper respiratory tract as it accelerates tracheal mucus secretion²⁰. The demulcent action is attributed to glycyrrhizin. It has been recently found that Liquiritin apioside is an active compound present in the methanolic extract of liquorice. The compound inhibits capsaicin- induced cough²¹ Antitussive and expectorant The liquorice powder and extract was found to be useful for the treatment of sore throat, cough and bronchial catarrh. It is antitussive and expectorant loosening and helping to expel congestion in the upper respiratory tract as it accelerates tracheal mucus secretion²⁰. The demulcent action is attributed to glycyrrhizin. It has been recently found that Liquiritin apioside is an active compound present in the methanolic extract of liquorice. The compound inhibits capsaicin- induced cough²¹ Antitussive and expectorant The liquorice powder and extract was found to be useful for the treatment of sore throat, cough and bronchial catarrh. It is antitussive and expectorant loosening and helping to expel congestion in the upper respiratory tract as it accelerates tracheal mucus secretion²⁰. The demulcent action is attributed to glycyrrhizin. It has been recently found that Liquiritin apioside is an active compound present in the metabolic extract of liquorice. The compound inhibits capsaicin- induced cough²¹ Antitussive and expectorant The liquorice powder and extract was found to be useful for the treatment of sore throat, cough and bronchial catarrh. It is antitussive and expectorant loosening and helping to expel congestion in the upper respiratory tract as it accelerates tracheal mucus secretion²⁰. The demulcent action is attributed to glycyrrhizin. It has been recently found that Liquiritin apioside is an active compound present in the methanolic extract of liquorice. The compound inhibits capsaicin- induced cough²¹ Antitussive and expectorant The liquorice powder and extract was found to be useful for the treatment of sore throat, cough and bronchial catarrh. It is antitussive and expectorant loosening and helping to expel congestion in the upper respiratory tract as it accelerates tracheal mucus secretion²⁰. The demulcent action is attributed to glycyrrhizin. It has been recently found that Liquiritin apioside is an active compound present in the methanolic extract of liquorice. The compound inhibits capsaicin- induced cough²¹ Antitussive and expectorant The liquorice powder and extract was found to be useful for the treatment of sore throat, cough and bronchial catarrh. It is antitussive and expectorant loosening and helping to expel congestion in the upper respiratory tract as it accelerates tracheal mucus secretion²⁰. The demulcent action is attributed to glycyrrhizin. It has been recently found that Liquiritin apioside is an active compound present in the methanolic extract of liquorice. The compound inhibits capsaicin- induced cough²¹ Antitussive and expectorant The liquorice powder and extract was found to be useful for the treatment of sore throat, cough and bronchial catarrh. It is antitussive and expectorant loosening and helping to expel congestion in the upper respiratory tract as it accelerates tracheal mucus secretion²⁰. The demulcent action is attributed to glycyrrhizin. It has been recently found that Liquiritin apioside is an active compound present in the methanolic extract of liquorice. The compound inhibits capsaicin- induced cough²¹ Antitussive and expectorant The liquorice powder and extract was found to be useful for the treatment of sore throat, cough and bronchial catarrh. It is

recently found that Liquiritin apioside is an active compound present in the *methanolic* extract of liquorice. The compound inhibits capsaicin-induced cough.

In another study, *ethanolic* extract of *Glycyrrhiza glabra* was found to be responsible for inhibition of 35.62% SO₂ gas induced cough in experimental animals (mice).^{20, 21, 22}

Anti-inflammatory activity

It is reported that glycyrrhetic acid in liquorice extract gives anti-inflammatory effect similar to glucocorticoids and mineralocorticoids. According to *in vitro* studies, glycyrrhizic acid inhibits all factors responsible for inflammation. It inhibits cyclo-oxygenase activity and prostaglandin formation (specifically prostaglandin E₂). It is also responsible for indirectly inhibiting platelet aggregation.²³

Anti-thrombotic activity

In a study, the *in-vivo* effects of *Glycyrrhiza glabra* extract and combined effect with Vitamin K and Heparin were evaluated in Sprague Dawley Rats. It was found that extract of *G. glabra* increased the bleeding time when given in the doses of 180 mg/kg and 360 mg/kg. Blood loss was evaluated 60 minutes later as a function of absorbance at 540 nm due to hemoglobin content in water solution. Altogether data indicates that *Glycyrrhiza glabra* is an effective anti-thrombotic agent.²⁴

Anti-ulcer activity

Glycyrrhizic acid, a major component of licorice, has anti-ulcer effect by raising the local concentration of prostaglandins that promote mucous secretion and cell proliferation in the stomach. In a previously reported study activity of Extractum liquoritiae (EL), glycyrrhizic acid, glycyrrhetic acid and a novel lipophilic derivative of glycyrrhetic acid monoglucuronide (GAMG), acetylated GAMG (aGAMG), were active against 29 *Helicobacter pylori* strains. The potent *in vitro* activity of glycyrrhizic acid against *H. pylori* concludes its beneficial effect on peptic ulcers.²⁵

Anti-microbial activity

Each species of the genus *Glycyrrhiza* Linn, is characterized by isoprenoid phenols, which have selective antimicrobial activity. A number of components isolated from *Glycyrrhiza* include glabridin, gabra, glabrol, glabrene, hispaglabridin A, hispaglabridin B; 40-methylglabridin and 3-hydroxyglabrol have exhibited potential *in vitro* antimicrobial activity. Glycyrrhizic acids have been used as a cure to atopic dermatitis, pruritis and cysts due to parasitic infestations of skin.^{26, 27, 28,}

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Anti-bacterial Activity

Secondary metabolites such as; saponins, alkaloids and flavonoids present in *hydro-methanolic* root extract of *Glycyrrhiza glabra*, possess potent antibacterial activity against *Staphylococcus aureus*. Moreover various studies on *aqueous* and *ethanolic* extracts of liquorice proved its inhibitory activity on cultures of *Staphylococcus aureus* and *Streptococcus pyogenes*.³⁰

Anti-fungal activity

Glycyrrhiza glabra possess good anti-fungal activity. In a study, it was reported that screening for antifungal compounds from various plant materials, liquorice extract with 80% methanol (oil based extract of liquorice; OEL) was found to possess high fungicidal effect against *Arthrimum sacchari* M001 and *Chaetomium funicola* M002 and its active compound was identified as glabridin. Thus, liquorice extract has a great potential in formulating cosmetic products with antiseptic activities.³¹

Anti-viral activity

It is reported that Glycyrrhizin has a prominent antiviral activity, as it does not allow the virus cell binding and inhibits the growth of viruses' including Herpes simplex, Japanese encephalitis virus and yellow fever virus. Antiviral activities of ribavirin, 6-azauridine, pyraziofurin, mycophenolic acid and glycyrrhizin against two clinical isolates of SARS (Severe Acute Respiratory Syndrome) virus (FFM-1 and FFM-2) from patients with SARS, admitted to clinical center of Frankfurt University, Germany were evaluated and it was observed that glycyrrhizin was the most effective in controlling viral replication and could be used as a prophylactic measure; glycyrrhizin has been previously used to treat patients suffering from HIV-1 and chronic hepatitis C virus.^{18, 32, 33,}

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Anti-oxidant activity

Glycyrrhiza have a significant free radical quenching effect. Liquorice flavonoids have exceptionally strong antioxidant activity. Antioxidant activity of liquorice flavonoids was found to be over 100 times stronger than that of antioxidant activity of vitamin E. Thus, liquorice extract can be efficiently used to formulate cosmetic products for the protection of skin and hair against oxidative damage.³⁵

Skin lightening and skin tightening activity

The extract of liquorice is reported to be an effective pigment lightening agent. Glabridin in the hydrophobic fraction of liquorice extract inhibits tyrosinase activity in cultured B16 murine

melanoma cells. Some other active compounds in liquorice extract like glabrene, Licochalcone A, Isoliquiritin are also responsible for inhibition of tyrosinase activity. Liquiritin present in liquorice extract disperse melanin, thereby inducing skin lightening.³⁶

Anti-malarial activity

Licochalcone A (a chalcone) present in liquorice has reported to possess very good antimalarial activity. All *Glycyrrhiza* species have this compound in different amounts and it can be isolated from them. *In vivo* studies against *P. yoelii* in mice with oral doses of 1000 mg kg⁻¹ have shown to eradicate malaria parasite completely. Also no toxicity was observed.³⁷

Anti-diabetic activity

Kuroda M *et al.* reported that ethyl acetate extract of liquorice exhibited a significant PPAR- γ (peroxisome proliferator-activated receptors) that function as transcription factors regulating the expression of genes involved in glucose and lipid metabolism binding activity. Finally reduces the blood glucose level in knockout diabetic mice.³⁸

Hepato-protective activity

Glycyrrhizin induced a significant reduction in serum amino-transferase and improved the liver histology. It has also been implicated that long-term usage of glycyrrhizin prevents development of hepatocellular carcinoma in chronic hepatitis C. *In vitro* studies have indicated that glycyrrhizin modifies the intracellular transport and suppresses hepatitis B virus (HBV) surface antigen (HbsAg).^{39, 40}

Memory enhancing activity

The effects of *Glycyrrhiza glabra* on learning and memory was investigated in mice. Elevated plus-maze and passive avoidance paradigm were used to test learning and memory. Three doses of *aqueous* extract of liquorice were administered [75, 150 and 300 mg/kg p.o.]. The study was conducted for 7 successive days in separate groups of animals. Significant improvement in learning and memory of mice was reported at the dose of 150 mg/kg.⁴¹

Hair growth stimulatory activity

Liquorice has a significant hair growth activity and it can be safely used in herbal formulations in treatment of various types of Alopecia. In a previous reported study hydro-alcoholic extract of liquorice showed good hair growth promoting activity. Comparison between liquorice extract and the standard drug used (Minoxidil 2%) showed that, 2% concentration of liquorice extract showed better hair growth stimulatory activity than 2% Minoxidil.⁴²

Immuno-modulatoractivity

In vitro studies proved that *Glycyrrhiza glabra* at 100µg/ml concentration, showed immuno-modulatory effects. It increases production of TCD₆₉ lymphocytes and macrophages from human granulocytes. According to *in vivo* studies, liquoriceroot extract was found to prevent the rise in the amount of immune-complexes related to autoimmune diseases like *systemic lupus erythematosus*.⁴³

Anti-convulsant activity

The anticonvulsant activity of *ethanolic* extract of roots and rhizomes of *Glycyrrhiza glabra* (10, 30, 100 and 500 mg/kg, i.p.) in mice was assessed using maximum electroshock seizure (MES) test and pentylenetetrazole (PTZ) using albino mice. The lithium-pilocarpine model of status epilepticus was also used to assess the anticonvulsant activity in rats. The *ethanolic* extract of *G. glabra* did not reduce the duration of tonic hindleg extension in the MES test even in the dose of 500 mg/kg. However, the extract significantly and dose-dependently delayed the onset of clonic convulsions induced by pentylenetetrazol. The dose of 100 mg/kg afforded protection to all animals. The extract also protected rats against seizures induced by lithium-pilocarpine. It was concluded that the *ethanolic* extract of *G. glabra* inhibits PTZ and lithium-pilocarpine-induced convulsions but not MES-induced.⁴⁴

CONCLUSION

At present scenario, there has been an increase in demand for the phyto-pharmaceuticals all over the world because of the fact that the allopathic drugs have more side effects. As per the ancient Unani classical literature, Unani physicians used *Asl-us-Sus* (*Glycyrrhiza glabra* Linn.) since centuries for asthma, bronchitis, ulcers, and an anti-inflammatory. In this regard, further studies need to be carried out to explore *Asl-us-Sus* (*Glycyrrhiza glabra* Linn.) for its potential in preventing and eating diseases.

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