

A Review on Glycyrrhiza Glabra and its Pharmacological Activities

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Abstract: Nature has always been an excellent source for many therapeutic compound providing us with any medicinal plant and microorganism providing beneficial chemicals. Therefore, the demand for medicinal plant, cosmetic and health product is always on the rise. A review of chemical constituent present in various parts of Glycyrrhiza glabra and their pharmacological action is given in present article. Glycyrrhiza glabra commonly known as Yashtimadha and Liquorice. Glycyrrhiza glabra Linn (Family: fabaceae) is a traditional medicinal plants used in various ancient medicine system and documented across the globe for it's ethanopharmacological value to cure varies of ailments. Glycyrrhiza glabra Linn possess antibactericidal, antioxidant, antimalarial, antispasmodic, anti-inflammatory and antihypertensive glycemic properties. Various other effect like antiulcer, antiviral, antifungal have also been discussed. These result are very encouraging and indicate this herb should be studies more extensive to confirm these result and reveal other potential therapeutic effect. A review of chemical constituent present in various part of Glycyrrhiza glabra and their pharmacological action is given in present article.

Keywords: Glycyrrhiza glabra, pharmacological action, Antibacterial, Liquorice or Licorice

I. INTRODUCTION

Herbal medicine are great demand in the development world of primary health care because of their in side effect, safety and lesser in side effect [6]. Glycyrrhiza is one of the most popular and important medicine plant belong to family Fabaceae or Leguminosae. Glycyrrhiza Glabra Linn is also called as liquorice, mulaith or yasthimadhu and sweet wood native mediterranea & certain of areas Asia Russia f china. They have been used medically since at least 500BC & Liquosice has been described the grand father of herbs [5][8]. Glycyrrhica word derived from the ancient Greek tem in "Glykos" meaning sweet and "rhiza" meaning root.

Glycyrrhiza is a component extract from liquorice (glycyrrhiza glabra) root. The most important bioactive, constituents of plants are tritespenoid, saponin, flavonoids, tannins, alkaloids and phenolic compound, The extract currently used in pharmaceutical & food industries as well as in the manufacture of functional food & food suppliment [7].

Glycyrrhizin inhibit liver cell injury and is given intravenously (IV) for the treatment of Chronic visrl hepatitis & cirrhosis in Japan. It is used in treatment of autoimmune hepatitis in one clinical trial. It is also used in herbal form called Shakuyaka - Kanzo-to to increase. fertility in women with polycystic ovetian syndrome G. glabra is important part in Ayurveda & Siddha assengement of ding acting on ulcer, protective, demulcent, expectorant, anti- tussive, purgative, respiratory in fection tremor's [5].

1.1 Geographical distribution of G. glabra:

1. **G. glabra varieties typica (Spanish liquorice):** The plant has purplish blue coloured papilionaceous flowers. It gives out large number of stolons.
2. **G. Glabra varieties glandulifera (Russian liquorice) :** It has a big root stock along with the number of elongated route but does not hear stolons.
3. **G. glabra varieties Violacea (perian liquorice) :** This plant show, violet flower.



Classification:

Kingdom	plantae
Division	Angiospermae
Class	Diocotyledineae
Order	Rosale
Family	Leguminosae
Genus	Glycyrrhiza
Species	glabra Linn

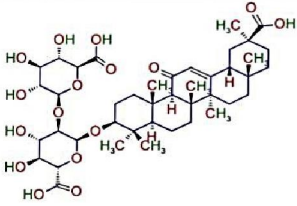
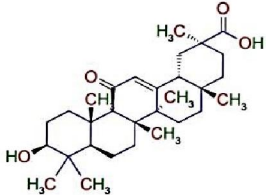
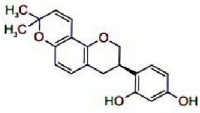
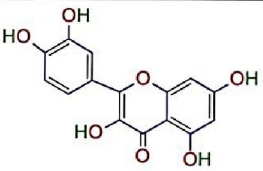
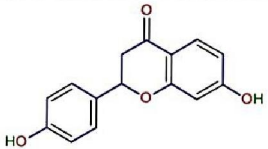
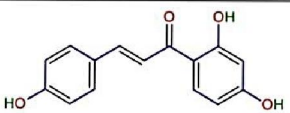
Vernacular Names

- **Sanskrit:-** Yashti-madhub , madhuka
- **Bengali:-** Jashtimadhu, Jaishbomodhu
- **Persia:-** plusareha mahaka
- **Gujarat:-** Jethimadhu
- **Kannada:-** yashtimadhuka , atimadhura
- **Malayalam:-** Iratimadhuram
- **Marathi:-** Jeshtamadha
- **Oriya:-** Jatimadhu
- **Tamil:-** Atimadhuram
- **Telugu:-** Atimadthurani
- **English:-** Liquorice
- **Hindi:-** Jothi-mash OR mulhatti
- **Arab:-** Aslussiesa
- **France:-** Boisdoux

II. CHEMICAL CONSTITUENT

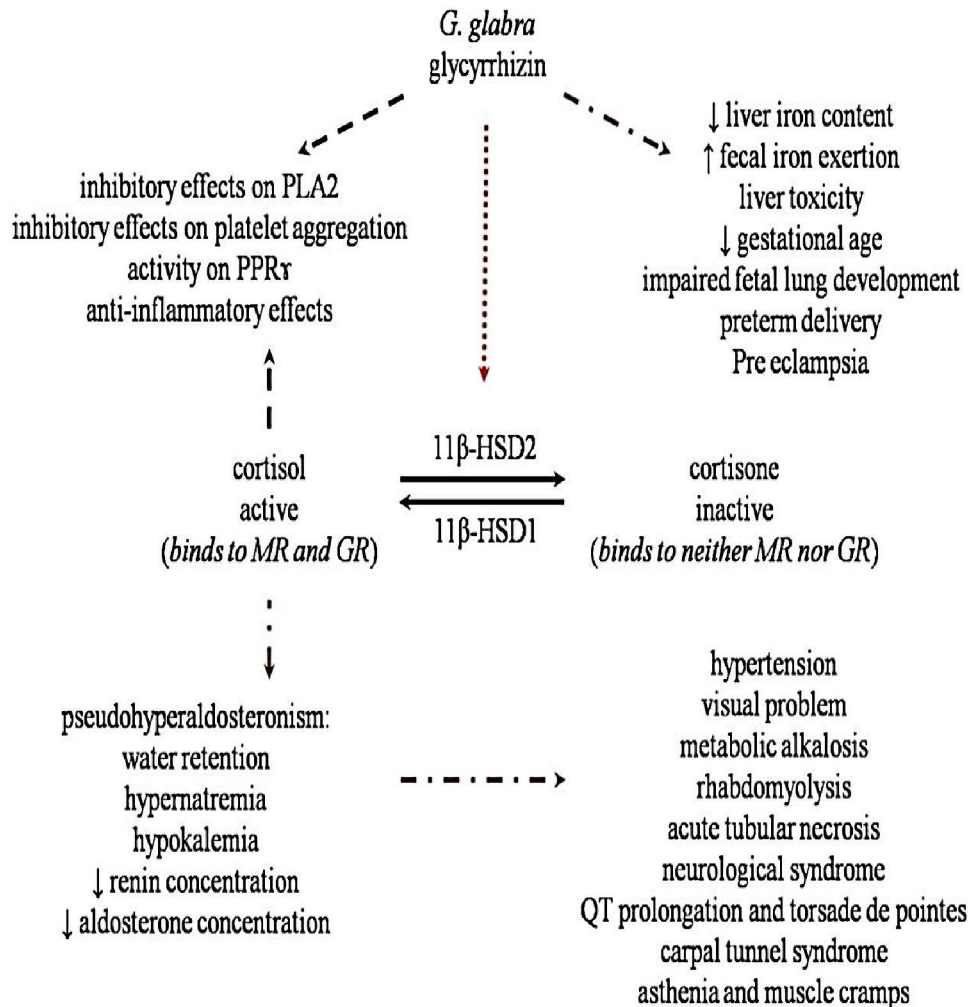
Glycyrrhiza glabra root contain several active compound including flavonoids, such as liquirtin, rhamnoliquiriln, prenyllicoflavan. A glucoliquiritin , a pioside , 1- metho- xyphaseolin, shinterocarpin , shinflayanone , coumarin and saponin namely glycyrrhizin. Glycyrrhizin is triterpenoid compound, represent the sweet taste of liquorice root. This compound speaks to a blend of glycyrrhizic corrosive that varies inside a 2-25 percent range. Glycyrrhizin is saponin compound as well as aglycon glycyrrhetic acid , a potent compound of G.glabra , Glycyrrhizin consist of glycyrrhetic acid , discharide and it can be found naturally as calcium and potassium salt in Liquorice root . In human glycyrrhizin can be metabolised and converted to glycyrrhetic acid. Thus the pharmacological activities of glycyrrhizin are similar to those of glycyrrhetic acid.

III. CHEMICAL STRUCTURES

Compound Name	Structure	Phytochemistry	Mechanism of Action
Glycyrrhizin		The main constituents are triterpene, saponins, and flavonoids.	Inhibited the prostaglandin, specifically prostaglandin E2 and cyclooxygenase activity as well as platelet aggregation.
Glycyrrhetic acid		Active phytoconstituents are 18β-glycyrrhetic acid, isoflavones, glabrin A and B, and glycyrrhizin.	Glycyrrhetic acid has shown anti-inflammatory activity and inhibited 11β-hydroxysteroid dehydrogenase
Glabridin		Glabridin is an isoflavane, a type of isoflavonoid. This product is part of a more prominent family of plant-derived molecules, the natural phenols.	Glabridin inhibited melanogenesis by two mechanisms (1) inhibited the production of ROS (2) inhibited tyrosine.
Quercetin		Plant-derived flavonoid.	How flavonoids inhibited enzymes is not known. It inhibits lipoxigenase and cyclooxygenase activities and decreases the production of inflammatory metabolites.
Liquiritigenin		Phenolic compounds,	It is inhibited through the pathways NLRP3 and NF-κβ.
Isoliquiritigenin		Phenolic compounds,	Reduce the inflammatory response of macrophages via the inhibition of the activation of AP-1, NF-κβ, and AP-1.

IV. MECHANISM OF ACTION

Glycyrrizin and glycyrrhizic acid have been show to inhibitory action on growth and cytopathology of numerous RNA and DNA viruse , including hepatitis A C herper zoster , HIV , herpes simplex and CMV and it metabolites inhibit hepatic metabolism of aldosteron and suppress 5-(beta)-reductase and was responsible for the well documented pseudoaldosteron syndrome. The compatibility in structure glycerhretic corrosive to the structure of hormone discharged by adrenal cortex represent the mineralocorticoid and glucocorticoid action of glycyrrhizin corrosive.



4.1 Traditional Uses

1. In the treatment of anaemia liquorice decoction or its powder was prescribed with honey.
2. Glycyrrhiza glabra is mixed with butter and used in burn and wound.
3. A solution of rice milk prepared with glycyrrhiza is used for hoarseness of voice; the best of yashti, milk, sesamum indicum mixed with butter are collectively used to treat edema.
4. Liquorice has been reported to treat many diseases such as asthma, tonsillitis, sore throat, hyperdyspnea, flatulence, epilepsy, fever, sexual disability, paralysis, coughs, stomach ulcers, heartburn, colic, swelling, rheumatism, skin disease, acidity, leucorrhea, bleeding, hemorrhagic, skin disease and jaundice.
5. Charaka prescribed Liquorice and santalum album, powder with milk in haematemesis.
6. Charaka prescribed 10g madhuka powder mixed with honey, followed by intake of milk, as aphrodisiacs and as an intellect promoting tonic.
7. A decoction of madhuka was applied on erysipelas.
8. A decoction of madhuka root is good wash for falling and greying of hair.
9. It is traditionally used as insecticide, laxative, anti-inflammatory, anti-ulcer, antibiotic, anti-arthritic, antiviral, memory stimulant due to its action as monoamine oxidase, oxidase inhibitor, anticholinergic, antitussive, anticaries, hypolipidemic, antimycotic, estrogenic, antioxidant, anticancer and antidiuretic agent.
10. It is used in confection industry such as in soft drinks, sweet and alcohol as well as in Tobacco industry.

4.2 Medicinal Uses

1. This plant species are reported in the literature for its biological activities such as and antiinflammatory and expectorant , the control coughing and has hormonal effect.
2. It detoxifies and protect the liver medicinally it is used internally for Addison disease , Asthma, Bronchitis, peptic ulcer, Arthritis, Allergic complaint and steroid therapy.
3. It is an important herbe for treating hormone related female problem. It is also used as an energy tonic, particularly, for the spleen, stomach and the root is added to many formulae . Root of a glycerrhiza glabra being tonic, demulcent laxative emollient are used in genito- urinary disease.
4. It is also useful in the gout , asthma, sore throat , tonsillitis, flatulence, sexual debility , epilepsy, hyperdypsia, fever, coughs , skin disease, swelling acidity, leucorrhoea, bleeding, jaundice, hiccough, hoarseness and vitiated condition of vata dosha, gastralgia, cephalalgia, ophthalmopathy and phrygodnia.
5. They are also used as food in the confectionery industry such as sweet, alcohol free drink etc. And in tobacco industry. Liquorice is also the basis for most proprietary laxative and it extract flavour,beer , soft drinks and pharmaceutical product and is used as a foaming agent in beer and fire extinguisher.

4.3 Pharmacological Activity



4.4 Modern Scientific Validation

The various pharmacological activity attributed to yasthimadhu demulcent , expectorant , anti allergic, anti-inflammatory , spasmolytic, mild laxative , anti stress, anti-depressive, anti ulcers, liver protection, and anti- diabetic [8].

A. Anti-tussive Activity

The liquorice powder and extract where found to be effective treatment of sore throat cough and bronchial catarrh [6]. The herb also promote pharyngeal and bronchial secretion leading to a good expectorant action. Glycyrrhizin help to reduce congestion in the upper respiratory track and increase tracheal mucus secretion. Liquorice decrease irritation and it works efficiently codeine in sore throat. Carbenoxolone is semisynthetic compound that increase gastric mucus secretion [5].

B. Anti - inflammatory Activity

Anti implementing activity of Glycyrrhiza Glabra has been established in several experimental animal model as well as clinical trials [8]. It promote the healing of ulcer of the stomach and mouth and this fact was known for over 2000 year [6]. G. glabra inhibit all factor responsible for inflammation. The cyclo oxygenase is activity and prostaglandin formation and also responsible for indirectly inhibitor platelet aggregation and exhibit it's fortiging activity on hydrocortisone mitigating action in rats [6].

C. Anti-Fungal Activity

G. glabra have great hostile to contagious movement ^[1]. It possess good Anti fungal activity and it was concluded that Glycyrrhiza may prove to be useful adjuvant drug in the treatment of several fungal infection ^[8]. Licorice extract with 80% methanol was found to possess high fungicidal effect against *Arthrinium sacchari* M001 and *chaetomium funicola* M002 and it's active compound was identified as glabridain ^[6].

D. Anti-Microbial Activity

G. glabra contain isoprenoid phenols that can selectively inhibit microbial growth . *G. glabra* against oral pathogens by diffusion method and determined the minimum inhibitory bactericidal concentration (MBC) by broth dilution method ,so it show good good Anti microbial activity and also it shows good antibacterial activity ^[5].

E. Antioxidant Activity

This activity of *G. Glabra* shows one of the most major reason for its uses . The phenolic compound are keep it in the protection of biological system against oxidative stress being able to inhibit the onset of skin damage and maintain the skin homeostasis due to its high antioxidant content ^[6].

F. Antidiabetic Activity

Diabetic mellitus is well known metabolic disorder that manifests high to insulin exhibit 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 ^[5]. Finally reduces the blood glucose level in knockout diabetic mice ^[6]. Glycyrrhizin enhances the level of glycohaemoglobin, cholesterol, and triglyceride by reducing serum insulin level and pancreatic islet cell numbers ^[9]. Thus, licorice can play a crucial role in insulin resistance-related illnesses ^[5].

V. NEW FINDING

5.1 Anticancer Activity

Products from *G. glabra* root have both anticancer activity and cancer preventive activity ^[8]. The properties of *G. Glabra* shows both in vivo and in vitro studies *G. glabra* inhibitory action of metabolic extract was observed against Caco-2 and PC-3 Licorice extract contains a plethora of phytoestrogen compounds ^[5] , Glycyrrhizinic acid can induce AKT/mTOR signals on endometrial and breast cancer cells and thus inhibit the pro-literation of these cancer cells ^[10].

5.2 Anti Immunomodulating Activity

Extracts of root of *G. glabra* have immunosuppressive activity^[8]. A study proved that Glycyrrhiza glabra at 100ug / ml concentration possess immunostimulatory effects ^[6]. polysaccharide extract of Glycyrrhiza stimulate the macro phages & increase the immune stimulations. It increase production of TCD69 Lymphocytes & macrophages from human granulocytes ^[6]. Licorice polysaccharides exhibited immunomodulatory activities in CT-26 tumos bearing BALB/c mice. The polysaccharides' significantly suppressed tumor growth & increased immune organ index. Crude extract ceroid of Glycyrrhizin at a dose of 2 mg / animal (IV) inhibited immane reaction in macrophages in mice ^[5]. The polysaccharide significantly suppressed tumor growth and increased immune organ Idex. Crude extract devoid of glycyrrhizin in at a dose of 2mg / animal (I.V.) inhibited immune reaction in macrophages In mice.^[8]

5.3 Hair Growth Stimulatory Effect

After carrying out study it was found that hydro alcoholic extract of liquroid showed a profound hair growth activity. In treating Glycyrrhiza *Glabra* has been long used as herbal medicine. It was found that 2% concentration of extraction as compared with the standard drug (minoxidil 2%) has shown better hair activity ^[5].

5.4 Anti-viral Activity

The oral administration of liquorice preparations containing glycyrrhiztinic acid are used in treatment of viral infection hepatitis and common cold ^[6]. Glycyrrhizic acid exhibitors direct anti – hepatitis virus activity and low toxicity in host cell. *G. glabra* inhibit the secretion of HBV surface antigen (HBsAg) in PLC / PRF/5 cell in-vitro ^[8].

TABLE 1: PHARMACOLOGICAL ACTIVITIES REPORTED FROM GLYCYRRHIZA GLABRA:

Sr. No	Activity	Part/Extract	Animal models & cell lines
1.	Immunomodulatory activity	Aqueous extract	<i>In vivo</i> phagocytosis, determination of cellular immune response haemagglutination antibody titre & plaque forming cell assay using sheep RBCs ²⁵
2.	Antitussive activity	Ethanol extract	SO ₂ gas induced cough in experimental animals. Mice showed an inhibition of 35.62% in cough on treatment with <i>G. glabra</i> extract ²⁶
3.	Anti-inflammatory activity	Hydroalcoholic extract	Carrageenan induced rat paw oedema at dose levels of 100,200,300 mg/Kg. The extract showed a maximum of 46.86% inhibitory action ²⁷
4.	Chronic fatigue stress	Hydroalcoholic extract	The extract showed the protective effect on mice on exposure to chronic fatigue stress ²⁸
5.	Antinociceptive activity	Ethanol extract	Different pain models in Swiss albino mice. Activity was evaluated at 50-200 mg/Kg ip in mice using various pain models like acetic acid induced abdominal constrictions, formalin induced hyperalgesia & tail flick method ²⁹
6.	Antiulcer activity	Aqueous, acetone, ethanolic extracts of leaves	Micro-organism used: <i>Helicobacter pylori</i> by agar well diffusion method ³⁰
7.	Hepatoprotective activity	Aqueous extract of roots	PCM induced rats hepatocytes damage <i>in vivo</i> . Rabbit models with acute liver injury induced by CCl ₄ ³¹
8.	Memory enhancing activity	Aqueous extract of roots	Three month old Wistar albino rats. Elevated -plus maze and Morris water -maze test were conducted ³²
10.	Anticonvulsant activity	Hexane, ethanol, methanol extract of leaves	Fractions were evaluated intraperitoneally in mice using maximal electroshock (MES) & pentylenetetrazol (PTZ) seizure tests ³³
11.	Antistress activity	Alcoholic & aqueous extract	Reduce stress in <i>Drosophila melanogaster</i> induced by Methotrexate at different conc. ³⁴
12.	Antioxidant activity	Methanol extract	The method based on scavenging activity & reduction capability of 1,1-diphenyl-2-picrylhydrazyl radical; Also against nitric oxide & superoxide radicals ³⁵
13.	Testicular toxicity	Aqueous extract	Carbendazim induced testicular toxicity in albino rats ³⁶
14.	Cytotoxic activity	CHCl ₃ , methanol & aqueous extract	<i>In vitro</i> cytotoxic activity using two different cell lines MCFT-cancerous & Vero-normal cell line ³⁷
15.	Enzyme inhibiting activity	Methanolic extract	Invitro inhibition of tyrosinase enzyme ³⁸
16.	Antihyperglycemic activity	-----	Male albino rats of Wistar strain ³⁹
17.	Antimalarial activity	Alcoholic extract	Micro-organism used: <i>Plasmodium falciparum</i> ; <i>Plasmodium yoelii</i> ⁴⁰
18.	Antiviral activity	Aqueous extract	Herpes simplex 1 & vesicular stomatitis virus ⁴¹
19.	Anticancer activity	Licorice extract	Ames test, Trp-p-1, Trp-p-2 in <i>S.typhimurium</i> TA 98 revertants ⁴²
20.	Estrogenic activity	Alcoholic extract	Mouse
21.	Antimycobacterial activity	Methanolic extract	Micro-organisms used: <i>Mycobacterium tuberculosis</i> H37Ra & H37Rv strain
22.	Antidyslipidaemic activity	Ethanol extract	Fractions significantly brought down LDL and VLDL in the HFD fed hamsters to various degrees
23.	Antimicrobial activity	Ether, Chloroform, acetone	Micro-organisms used: <i>E. coli</i> , <i>B. subtilis</i> , <i>P. aerogenosa</i> , <i>S. aureus</i> ⁴³

VI. CONCLUSION

This review examined the medicinal properties and all the phytochemical molecule isolated from Glycyrrhiza glabra . Glycyrrhetic acid, 18-Beta glycyrrhetic acid , glycyrrhizin and licochalcone are main constituent that have been isolated from *G. glabra* extract. Pharmacologically *G. glabra* and its main constituent possess antimicrobial , antiparasitic , antiviral , antitussive , immuno-enhancing , antioxidant, anti-inflammatory and anticancer effect.

Presence of chemical compound indicate that the plant could Serve as “lead” for development of novel agent for further disorder in coming year. In this regard for the studies and need to be carried out to explore *Glycyrrhiza glabra* Linn for its potential in preventing and treating disease. Show the present review article gives a direction for future investigator to carry out research on the plant so that they could get some medicinal important drug.

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