EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 7
Issue: 7
330-334
Year: 2020

A REVIEW ON GLYCYRRHIZA GLABRA LINN (LIQUORICE) - AN EXCELLENT MEDICINAL PLANT

Akash V. Lohar*[1], Anjali M. Wankhade[2], Mohd. Faisal[3] and Akshay Jagtap[4]

[1,2,3,4]Department of Pharmacology, Vidyabharti College of Pharmacy, Amravati University, Amravati (MH) India 444602.

***Corresponding Author: Akash V. Lohar**
Department of Pharmacology, Vidyabharti College of Pharmacy, Amravati University, Amravati (MH) India 444602.

Article Received on 14/05/2020 **Article Revised on 04/06/2020** **Article Accepted on 24/06/2020**

ABSTRACT
Plants have been one of the important sources of medicines for human being and animals since the ancient time. At present scenario there is an increasing demand for herbal medicines, health products and pharmaceuticals products. Herbal medicines have attained popularity at global level to replace the synthetic chemicals as they have shown less adverse reactions. *Glycyrrhiza glabra Linn*, is a herb belonging to the family Leguminoceae. It is widely used in ayurvedic formulations. This review article is presented to phytochemical constituents and pharmacological activities, which were performed by widely different methods. It contains glycyrrhizin, which is a saponin glycoside, flavanoides, Carbenoxolone etc. *Glycyrrhiza glabra Linn* possesses different pharmacological activities such as antibacterial, antioxidant, antimalerial, Immunostimulatory activity, anti-tussive, anti-viral, anti-inflammatory and anti hyper glycemic properties. Various other effects like antiulcer, antiviral, antihapatotoxic, antifungal and herpes simplex have also been studies. These results are very encouraging and indicate this herb should be studies more extensively to confirm these results and reveal other potential therapeutic effects.

KEYWORDS: *Glycyrrhiza glabra* Linn, Mulethi, Glycyrrhizin, expectorant, anti-viral etc.

INTRODUCTION
Plants have been one of the important sources of medicines since the beginning of human cultivation. There is a growing demand for plant based medicines, health products, pharmaceuticals, food supplements, cosmetics etc. Glycyrrhiza glabra L. (Fabaceae) generally known as mulaithi, sweet wood or liquorice is a small perennial herb native to the mediterranean region, central and southwest asia. This herb is cultivated in various parts of the world including Italy, Russia, France, UK, USA, Germany, Spain, China and Northern India. It has provided us some of important bioactive constituents for life saving drugs, used in the armamentarium of modern medicine. However, among the estimated 250,000-400,000 plant species, only 6% have been studied for biological activity, and 15% have been investigated phytochemically.[1] It is widely used in ayurvedic formulations. Plants have been one of the important sources of medicines since the beginning of human cultivation. There is a growing demand for plant based medicines, health products, pharmaceuticals, food supplements etc. Medicinal plants are of great importance to the health of individuals and communities. It constitutd various phytoconstituents like triterpenoidal saponin, flavonoids, tannins, alkaloids and phenolic compounds.[2] There is a need for planned activity guided phyto-pharmacological evaluation of herbal drugs. The dried rhizomes and roots of the plant are used as carminatives in various parts of world like Egypt, Chinese, Greek, Indian, and Roman. It has extensive pharmacological effects for human being.[3,4]

MORPHOLOGY
Glycyrrhiza glabra Linn is a hardly perennial shrub, attaining a height up to 2.5m. The leaves are compound, imparipinnate, alternate, having 4-7 pairs of oblong, elliptical or lanceolate leaflets. The flowers are narrow, typically papilionaceous, borne in axillary spikes, lavender to violet in color. The calyx is short, campanulate, with lanceolate tips and bearing glandular hairs. The fruit is a compressed legume or pod, up to 1.5cm long, erect, glabrous, somewhat reticulately pitted, and usually contains 3-5 brown reniform seeds. The taproot is approximately 1.5cm long and subdivided into 3-5 subsidiary roots.[5]

Figure 1: Plant of Glycyrrhiza glabra.

Figure 2: Root of Glycyrrhiza glabra.

SCIENTIFIC CLASSIFICATION

Kingdom - Plantae
Division - Angiospermae
Class - Dicotyledoneae
Order - Rosales
Family - Leguminosae
Genus - Glycyrrhiza S
Pecies - glabra Linn
Binomial Name - Glycyrrhiza glabra L.

VERNACULAR NAMES[6]

Sanskrit	-	Yashtimadhu, Madhuka
Telugu	-	Atimadhuramu, Madhuka
Tamil	-	Atimadhuram
Kannada	-	Yashtimadhuka, atimaddhura
Malayalam	-	Irattimadhuram
Hindi	-	Mulethi
English	-	Liquorice root
Gujarati	-	Jethimadh
Bengali	-	Yashtimadhu

PHYTOCHEMICAL CONSTITUENTS

The roots of *Glycyrrhiza glabra Linn* contain glycyrrhizin, which is a saponin glycoside that is 60 times sweeter than cane sugar; Flavonoid rich fractions include liquirtin, isoliquertin liquiritigenin and rhamnoliquirilin and five new flavonoids- glucoliquiritin apioside, prenyllicoflavone A, shinflavanone, shinpterocarpin and 1-methoxyphaseolin[7,8] isolated from dried roots. Isolation and structure determination of licopyranocoumarin, licoarylcoumarin, glisoflavone and new coumarin-GU-12 also isolated. Four new isoprenoid-substituted phenolic constituents – semilicoisoflavone B, 1-methoxyficifolinol, isoangustone A, and licoriphenone isolated from roots.[7] A new prenylated isoflavan derivative, kanzonol R was also isolated. The presence of many volatile components such as pentanol, hexanol, linalool oxide A and B, tetramethyl pyrazine, terpinen-4-ol, α-terpineol, geraniol and others in the roots is reported. Presence of propionic acid, benzoic acid, ethyl linoleate, methyl ethyl ketine, 2,3-butanediol, furfuraldehyde, furfuryl formate, 1-methyl-2-formylpyrrole, trimethylpyrazie,maltol and any other compounds is also isolated from the essential oil.[8] The Indian roots show various 2-methyliso - flavones, and an unusual coumarin, C liquocoumarin, 6 - acetyl- 5, hydroxy- 4 - methyl coumarin. Asparagine is also found.[9] Glycyrrhizin (glycyrrhizic acid; glycyrrhizinate) constitutes 10–25% of licorice root extract and is considered the primary active ingredient. Glycyrrhizin is a saponin compound comprised of a triterpenoid aglycone, glycyrrhetic acid (glycyrrhetinic acid; enoxolone) conjugated to a disaccharide of glucuronic acid. Both glycyrrhizin and glycyrrhetic acid can exist in the 18α and 18β stereoisomers.[10] As a tribasic acid, glycyrrhizin can form a variety of salts and occurs naturally in licorice root as the calcium and potassium salts. The ammoniated salt of glycyrrhizin, which is manufactured from licorice extracts, is used as a food flavoring agent and specifications for this salt form have been established in the Food Chemicals Codex.[11] Carbenoxolone (18-β glycyrrhetinic acid hydrogen succinate), an analog of glycyrrhetic acid, is used in the

treatment of some alimentary tract ulcerative conditions, such as peptic ulcers.[12]

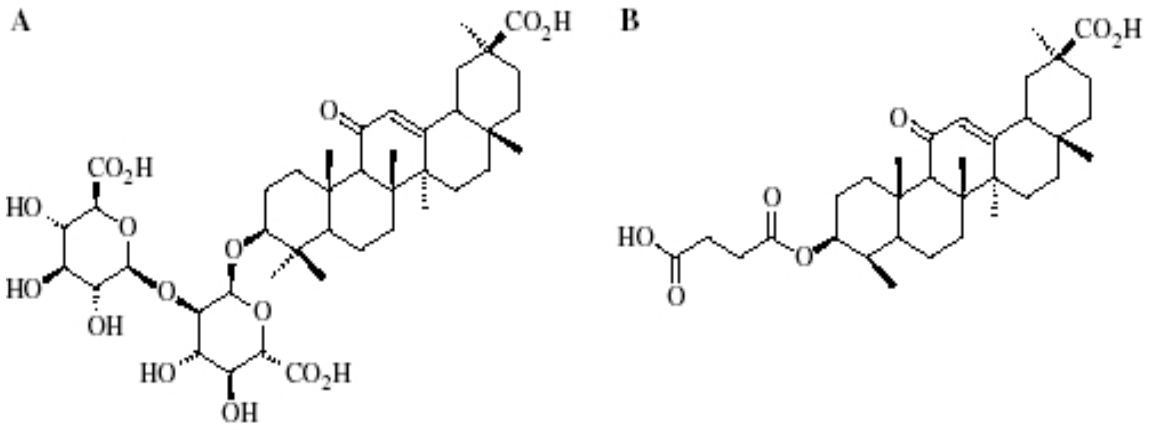

Figure 3: (A) Chemical structure of Glycyrrhizin and (B) Carbenoxolone.

PHARMACOLOGICAL ACTIVITIES

1. Anti ulcer activity

Glycyrrhizinic acid, a major component of licorice, has antiulcer effect by raising the local concentration of prostaglandins that promote mucous secretion and cell proliferation in the stomach. In a previous reported study activity of Extractum liquiritiae (EL), glycyrrhizic acid, glycyrrhetinic acid and a novel lipophilic derivative of glycyrrhetinic 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.[13]

2. Immunostimulatory activity

A studies proved that Glycyrrhiza glabra at 100µg/ml concentration, possess immunostimulatory effects. It increases production of TCD69 lymphocytes and macrophages from human granulocytes. In a previous reported study, liquorice root extract was found to prevent the rise in the amount of immune-complexes related to autoimmune diseases like systemic lupus erythematosus.[14]

3. Anti-fungal activity

Glycyrrhiza glabra possess good anti fungal activity. In a previous reported study of screening for antifungal compounds from various plant materials, licorice extract with 80% methanol (oil-based extract of licorice; OEL) was found to possess high fungicidal effect against Arthrinium sacchari M001 and Chaetomium funicola M002 and its active compound was identified as glabridin.[15] Thus, liquorice extract has a great potential in formulating cosmetic products with antiseptic activities.

4. Anti-malarial activity

Licochalcone A (a chalcone) present in liquorice is responsible for antimalarial activity. A previous reported study against P. yoelii in mice with oral doses of 1000 mg kg-1 have shown to eradicate malaria parasite completely.[16]

5. Antioxidant 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.[17,18]

6. Anti-tussive and Antidemulcent activity

The liquorice powder and extract were found to be effective in the treatment of sore throat, cough and bronchial catarrh. Liquorice has been shown to work as efficiently as codeine in sore throat. It decreases irritation and produces expectorant effects. Carbenoxolone (a semi synthetic compound derived from Glycyrrhiza) stimulates gastric mucus secretion. Glycyrrhizin is responsible for demulcent action of liquorice. Liquiritin apioside, an active compound present in the methanolic extract of liquorice which inhibits capsaicin induced cough.[19]

7. 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.[20]

8. Anti-viral effects

It is reported that liquorice extract inhibits the growth of viruses, including herpes simplex, Varicella zoster, Japanese encephalitis, influenza virus, vesicular stomatitis virus and type A influenza virus. Glycyrrhizin

does not allow the virus cell binding. Thus, it is found to have a prominent antiviral activity.[21]

9. Antithrombotic effect

In a previous reported study the in-vivo effects Glycyrrhiza glabra extract and combined effect with Vitamin K and Heparin were evaluated in Sprague Dawley Rats. It is 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 minute 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.[22]

10. Hair growth stimulation

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.[23]

11. Skin lightening 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.[24]

12. Anti-inflammatory activity

It is reported that glycyrrhetinic acid in liquorice extract gives anti-inflammatory effect similar to glucocorticoids and mineralocorticoids Liquorice root (Glycyrrhiza) extract promotes the healing of ulcers of the stomach and mouth and this fact was known for over 2000 years. According to studies, glycyrrhizic acid inhibits all factors responsible for inflammation. It inhibits cyclooxygenase activity and prostaglandin formation. It is also responsible for indirectly inhibiting platelet aggregation.[25]

13. Anti-diabetic activity

In a previous study Kuroda M et al., reported that ethyl acetate extract of licorice exhibited a significant PPARγ (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.[26]

CONCLUSION

There has been an increase in demand for the phytopharmaceuticals all over the world because of the fact that the allopathic drugs have more side effects. This forms a good basis for the selection of plant for further phytochemical and pharmacological investigation. The pharmacological and clinical studies reported in the present review confirm the therapeutic value of Glycyrrhiza glabra. Presence of chemical compounds indicates that the plant could serve as "lead" for development of novel agents for disorders in the coming years. In this regard, further studies need to be carried out to explore Glycyrrhiza glabra Linn for its potential in preventing and treating diseases. So, the present review gives a direction for future investigators to carry out research on the plant so that they could get some medicinally important drugs.

REFERENCES

1. Chopra RN, Chopra IC. Indigenous drugs of India. 2nd edition. Kolkata, Academic Publishers, 1958; 183-187.
2. Hill AF. Economic Botany. A textbook of useful plants and plant products. 2nd edition McGarw-Hill Book Company Inc, New-York, 1952; 125-129.
3. Setzer N, Natural Products Drug Discovery, 1999; 263.
4. Available from website http://plants.usda.gov. [accessed on Feb 25 2011].
5. http://www.divineremedies.com/glycyrrhiza_glabra. html (15/09/2009).
6. The Ayurvedic Pharmacopoeia of India: Ministry of Health and Family Welfare, Department of Health, Govt. of India, Volume - 1, 1st edition. p.127.
7. Rastogi RP and Mehrotra BN. Compendium of Indian Medicinal Plants published by Central Drug Research Institute, Lucknow and National Institute of Sciences Communication and Information Resources, New Delhi, 1990-1994; 6: 395-398.
8. The wealth of India, A Dictionary of Indian Raw Materials and Industrial Products, First supplement series, published by *National Institute of Sciences Communication and Information Resources*, CSIR, New Delhi, 2005; 3: D-1, 195-198.
9. Li W, Asada Y, and Yoshikawa T. Flavonoid constituents from *Glycyrrhiza glabra Linn* hairy root cultures, *Phytochemistry*, 2000; 55(5): 447-56.
10. Washington DC, Food Chemicals Codex, fifth ed. National Academy Press, 2003; 25.
11. Wang ZY, Athar M, and Bickers DR, Licorice in foods and herbal drugs: Chemistry, pharmacology, toxicology and uses. In: Mazza, G., Oomah, B.D. (Eds.), Herbs, Botanicals & Teas. Technomic Publishing Co. Inc, Lancaster, PA, 2000; 321–353.
12. Isbrucker RA and Burdock GA, Regulatory Toxicology and Pharmacology, 2006; 46: 167–192.
13. Krausse R, Bielenberg J, Blaschek W, Ullmann U. In and anti- Helicobacter pylori activity of Extractum liquiritiae, glycyrrhizin and its

metabolites. J Antimicrob Chemother, 2004; 54(1): 243-246.
14. Ju HS, Li XJ, Zhao BL, Han ZW, Xin WJ. Effects of Glycyrrhiza Flavonoids on lipid peroxidation and active oxygen radicals. Acta Pharm Sinicia, 1989; 24(11): 807-812.
15. Hojoa H, Satob J. Antifungal Activity of Licorice (Glycyrrhiza glabra) and potential applications in beverage foods. Food Ingredients J Japan, 2002; 203. https://doi.org/10.1016/j.apsb.2015.05.005
16. Sianne S, Fanie RVH. Antimalarial activity of plant metabolites. Nat Prod Rep., 2002; 19: 675-692. https://doi.org/10.3390/ijms19051382
17. Kiso Y, Tohkin M, Hikino H. Mechanism of antihepatotoxic activity of glycyrhhizin, I: Effect on free radical generation and lipid peroxidation. Planta Medica, 1984; 50: 298-302. https://doi.org/10.1055/s-2007-969714
18. Demizu S, Kajiyama K, Takahashi Y, Hiraga S, Yamamoto Y, Tamura K, Kinoshita T. Antioxidant and antimicrobial constituents of licorice: isolation and structure elucidation of a new benzofuran derivative. Chem Pharm Bull, 1988; 36: 3474-3479. https://doi.org/10.1248/cpb.36.3474
19. Xu-ying W, Ming L, Xiao-dong L and Ping H. Hepatoprotective and anti hepatocarcinogenic effects of glycyrrhizin and matrine. J Chemico-Biological Interac., 2009; 181(1): 15-19. https://doi.org/10.1016/j.cbi.2009.04.013
20. Sharma V, Agrawal RC, Pandey S. Phytochemical screening and determination of anti-bacterial and antioxidant potential of Glycyrrhiza glabra root extracts. J Environ Res Develop, 2013; 7(4A): 1552-1558.
21. Pompei R, Pani A, Flore O, Marcialis MA, Loddo B. Antiviral activity of glycyrrhizic acid. Experientia, 1980; 36: 304. https://doi.org/10.1021/jm0493008
22. Mendes-Silva W, Assafim M, Ruta B, Monteiro RQ, Guimaraes JA, Zingali RB. Antithrombotic effect of Glycyrrhizin, a plant-derived thrombin inhibitor. Thromb Res., 2003; 112: 93-98. https://doi.org/10.1016/j.thromres.2003.10.014
23. Roy SD, Karmakar PR, Dash S, Chakraborty J, Das B. Hair growth stimulating effect and phytochemical evaluation of hydro-alcoholic extract of Glycyrrhiza glabra. Global J Res Med PLants Indigen Med, 2014; 3(2): 40-47.
24. Cronin H, Draelos ZD. Top 10 botanical ingredients in 2010 anti-aging creams. J Cosm Derm,s 2010; 9(3): 218-225. https://doi.org/10.1111/j.1473-2165.2010.00516.x
25. Ohuchi K, Tsurufuji A. A study of the anti-inflammatory mechanism of glycyrrhizin. Mino Med Rev., 1982; 27: 188- 193.
26. Kuroda M, Mimaki Y, Sashida Y, Mae T, KishidaH, Nishiyama H, Tsukagawa M, Konishi E, Takahashi K, Kawada T, Nakagawa K and Kitahara M, Phenolics with PPAR–Ligand-binding activity obtained from Licorice (Glycyrrhiza uralensis roots) and ameliorative effects of Glycyrin on genetically diabetic KK-Ay mice. Bioorg Med Chem Lett., 2004; 55-61. https://doi.org/10.1016/j.bmcl.2003.09.052