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REVIEW ARTICLE

Reviewing the Therapeutic Uses and Pharmacology of *Glycyrrhiza glabra*

Snega K[1], Vijayalakshmi M.K[2], Nadhiya J[1], Showbharnikhaa S[1]

[1]*Student, Faculty of Pharmacy, Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India*
[2]*Associate Professor, Faculty of Pharmacy, Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India*

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Abstract:
Liquorice is widely acknowledged as a potent medicinal herb, with its roots and rhizomes being utilized in traditional medicine for generations due to their well-established therapeutic properties. Despite the presence of hepatotoxic pyrrolizidine alkaloids (PAs) in various medicinal herbs, which can lead to liver damage, no such toxicity has been observed when liquorice is used in combination with these herbs, particularly as an antihepatitis remedy. Since ancient times, medical practitioners and herbalists have harnessed the medicinal benefits of the liquorice plant (*Glycyrrhiza glabra* L., previously known as Liquiritae officinalis Moench). Modern research has validated many historical claims regarding the effectiveness of liquorice extracts, decoctions, and potions. Glycyrrhizin, a key component found in liquorice roots, is recognized as its primary biologically active compound. It works by inhibiting renal 11ß-hydroxysteroid dehydrogenase, allowing cortisol to activate mineralocorticoid receptors, potentially leading to hypokalemia and hypertension. Additionally, both crude liquorice extract and its main constituent, glycyrrhizin, have demonstrated antiradical activity, protection against lipid peroxidation of liposomal membrane, and inhibition of reactive oxygen species (ROS) release in whole blood. However, excessive consumption of liquorice can result in hypermineralocorticoidism, characterized by potassium imbalance, fluid retention, elevated blood pressure, and suppression of the renin-angiotensin-aldosterone system.

Keywords: Liquorice; *Glycyrrhiza glabra*; Antihepatitis; Glycyrrhizin; ROS; RAAS

1. Introduction

Glycyrrhiza glabra Linn, commonly known as liquorice, holds a prominent place among the medicinal herbs rooted in the ancient practices of Ayurveda. Its name, derived from the Greek words "glykos" for sweet and "rhiza" for root, underscores its naturally sweet flavor. Belonging to the Leguminosae family, liquorice is the root of *Glycyrrhiza uralensis* Fisch. *Glycyrrhiza glabra* L., or *Glycyrrhiza inflata* Bat., and finds extensive usage in both medicinal and confectionary realms. [1-3] Indigenous to southern Europe and various regions of Asia, liquorice is notably utilized in candies and sweeteners across Europe and the Middle East. Traditional Chinese Medicine (TCM) highlights liquorice's efficacy in addressing medication toxicity, excessive phlegm, asthma with coughing, and fatigue. Moreover, it is valued for its ability to enhance the properties of other herbs in Chinese herbal formulations. The sweetness of liquorice root, attributed to glycyrrhizin, surpasses sucrose in intensity by 50 times. [4,5]

Historically, liquorice has been employed to treat a spectrum of ailments including cardiovascular issues, skin conditions, ulcers, respiratory disorders, and inflammation-related ailments like arthritis. Its medicinal properties, particularly its anti-inflammatory and antiatherogenic characteristics, stem from compounds like glycyrrhizinic acid and glycyrrhetinic acid, which inhibit cortisol metabolism. [6] With documented expectorant, antiviral, and ulcer-healing properties, liquorice serves as a versatile remedy for gastrointestinal and respiratory conditions. Its anti-inflammatory and antioxidative properties have also been explored in the context of chronic inflammatory disorders and asthma. [7]

While considered a safe flavoring agent, excess consumption should be monitored, especially when combined with other liquorice-based products. Liquorice's therapeutic potential extends to treating various conditions including gout, anemia, sore throats, digestive issues, skin disorders, and inflammatory conditions. It has been traditionally utilized in Ayurvedic and Korean medicine for its anti-inflammatory, immunomodulatory, and detoxifying properties. [8] Research underscores glycyrrhizin's role as an anti-inflammatory agent akin to corticosteroid hormones, showcasing its efficacy in conditions like liver cirrhosis and chronic hepatitis.

* Corresponding author: Snega K

2. Chemical composition

The chemical composition of Glycyrrhiza glabra includes:

1.1. Flavonoids

A wide array of Glycyrrhiza species have been documented to possess over 300 flavonoids. These include commonly found flavonoid subclasses such as flavanones, chalcones, isoflavanes, flavones, and isoflavones. Liquiritin and isoliquiritin are examples of flavonoids contributing to the yellow hue of G. glabra. Notable liquorice flavonoids encompass glabrol, licoflavanone, isoliquiritigenin, neoisoliquiritin, licuraside, licochalcone A and B, licoricidin, 7-methillicoricidin, hispaglabridin A and B, liocflavone A and B, liocflavanol, glyzaglabrin, licoisoflavanone, glabroisoflavanone, glabrone, licoricone, and gancaonin [9, 10].

1.2. Saponins

The hallmark constituents of liquorice, glycyrrhizic acid and glycyrrhizin, are triterpenoid saponins sourced from the root of the Glycyrrhiza plant, imparting its characteristic sweetness. Glycyrrhizic acid serves as the primary triterpenoid saponin in liquorice root, also serving as the primary sweetening agent for the herb [11].

1.3. Phenolic Compounds

Key phenols in liquorice include liquiritin, isoliquiritin, apioside of liquiritin, isoprenoid-substituted flavonoids, chromenes, coumarins, and dihydrostilbenes [12].

1.4. Essential Oils and Other Compounds

Secondary metabolites found in liquorice encompass fatty acids, phenol, guaiacol, asparagines, glucose, sucrose, starch, polysaccharides, and sterols (β-sitosterol, dihydrostigmasterol) [13].

3. Cultural significance

The cultural significance of liquorice is multifaceted, encompassing its diverse culinary applications, symbolic representations, ritualistic roles, and historical prominence. Its capacity to transcend cultural boundaries and foster unity among people through shared customs underscores its enduring presence in civilizations worldwide. Derived from the root of the Glycyrrhiza plant, liquorice holds profound cultural value globally, owing to its versatile uses and extensive historical background. [14] In ancient societies like Egypt, China, and Mesopotamia, liquorice was highly esteemed for its therapeutic properties, serving as a favored remedy for various ailments, particularly digestive and respiratory disorders, owing to its inherent sweetness and medicinal attributes. Its reputation for promoting health and healing has ingrained liquorice into customs, ceremonies, and traditional medicinal practices. [15-17]

The culinary significance of liquorice further underscores its cultural importance, being a prevalent ingredient in diverse cuisines worldwide, utilized in sweets, beverages, and traditional confections. While Western cultures commonly recognize liquorice flavoring, its role in Middle Eastern desserts like Turkish delight exemplifies its ability to bridge cultural gaps through shared culinary experiences.Liquorice's involvement in festivities and ceremonies across different traditions symbolizes sweetness and good fortune, often exchanged as a symbolic gift during celebrations. [18] Its inclusion in customary rites connects generations and underscores its enduring cultural relevance. In traditional Chinese medicine, liquorice is viewed as a mediator, balancing the effects of other herbs in herbal compositions, symbolizing bodily harmony and balance, which aligns with the holistic approach to health. Beyond its utilitarian purposes in food and medicine, liquorice has found expression in literature, folklore, and art, reflecting its historical significance and symbolic associations with endurance and resilience, stemming from its adaptability to various conditions. [19-21]

4. Safety Profile

While liquorice has a long history of use in both medicinal and culinary contexts, it's crucial to acknowledge the potential risks and side effects associated with its consumption. Glycyrrhizin, a compound found in liquorice, has been implicated in various health concerns. Firstly, it can elevate blood pressure and induce sodium retention, posing a significant risk, particularly for individuals prone to fluid retention or hypertension. [22, 23] Additionally, glycyrrhizin can disrupt hormonal balance by increasing cortisol levels through the inhibition of the enzyme 11-beta-hydroxysteroid dehydrogenase, potentially resulting in symptoms such as weight gain, water retention, and hormonal imbalances. Regular consumption of liquorice may also deplete potassium levels, essential for heart and muscle function, leading to fatigue, irregular heartbeats, and muscle weakness. Moreover, liquorice can interact unfavorably with certain medications, including those for diabetes, blood thinners, and hypertension, potentially compromising their efficacy and absorption. Excessive consumption of liquorice may also cause edema and swelling, particularly in the legs, due to its effects on sodium retention. Expectant mothers should be cautious as glycyrrhizin has been associated with an increased risk of preterm

birth and developmental issues in newborns.[24] Hence, while liquorice offers various benefits, its consumption should be approached with caution, particularly considering these potential adverse effects.

5. Conclusion

The use of liquorice in traditional medicine, particularly for ailments related to digestion and respiration, underscores its medicinal importance. However, caution is warranted due to the potential adverse effects of glycyrrhizin, which include hypertension, hormonal imbalances, and potassium depletion. Ongoing research is shedding light on promising aspects such as its antioxidant and anti-inflammatory properties, despite associated risks. Given the complexity of liquorice, a prudent approach emphasizing moderation and individual health considerations is essential. Further research is imperative to fully grasp liquorice's medicinal potential and ensure its safe incorporation into healthcare practices while mitigating any potential adverse effects.

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Author's short biography

Vijayalakshmi M.K

Vijayalakshmi M.K. is working as an Associate Professor in department of Pharmaceutical Chemistry /Analysis at Faculty of Pharmacy, Bharath Institute of Higher Education and Research. She has completed her post-graduation in Pharmaceutical Chemistry in Madaras Medical College, Chennai. She has vast experience in Research and Development in various industries and Organisation. Her present interest on research in Computer Aided Drug Design with strong background in various pharmaceutical field as Quality Control Chemist, Senior Research Scientist and Academic Field. She has published numerous research articles in peer reviewed national and international journals, edited book chapters and associated as an editor for many books

Snega K

Final year, B Pharmacy student at Faculty of Pharmacy, Bharath institute of higher education and research, Tambaram, Tamilnadu, India

Nadhiya J

J. Nadhiya, B.Pharm Final year student at Faculty of Pharmacy, Bharath Institute of Higher Education and Research

Showbharnikhaa S

S.Showbharnikhaa, B.Pharm Final year student at Faculty of Pharmacy, Bharath Institute of Higher Education and Research