INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA):IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

Review on Licorice Plant (*Jaist Madhu*)

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ARTICLE INFO
Received: 11 May 2024
Accepted: 15 May 2024
Published: 29 May 2024
Keywords:
Glycyrrhiza glabra
pharmacology
phytochemistry
toxicology
traditional use .
DOI:
10.5281/zenodo.11386182

ABSTRACT

Since natural compounds are generally thought to be safe, consumers have become much more aware of natural medicines and principles in recent years. However, the industry is becoming more and more interested in using plants that are used in traditional medicine in foods, nutraceuticals, cosmetics, and even medications. Glycyrrhiza glabra Linn. is a member of the Fabaceae family and has been valued for its ethnopharmacological properties since ancient times. This plant contains a variety of phytocompounds with diverse pharmacological activities, including glycyrrhizin, 18β-glycyrrhetinic acid, glabrin A and B, and isoflavones. Numerous extracts and pure compounds from this species have been shown through pharmacological experiments to exhibit a wide range of biological properties, such as antibacterial, anti-inflammatory, antiviral, antioxidant, and antidiabetic activities. Certain toxicological studies have raised some red flags. All of those concerns are covered in this review, which also concentrates on the pharmacological actions associated with G. glabra. To explore G. glabra's therapeutic potential and future challenges for use in the formulation of new products that will improve human well-being, an extensive, critical, and up-to-date overview of the current knowledge about its composition and biological activities is presented here.

INTRODUCTION

There has never been a more significant role for plants in medicine since human cultivation methods began. Today, feed and food are frequently made from members of the Fabaceae family, also known as Leguminosae, which includes Glycyrrhiza glabra, one of the most well-known medicinal plants. Greek terms glykos (sweet) and rhiza (root) are the source of the genus Glycyrrhiza. It is also known by the following names: liquirizia and regaliz (in Italian and Spanish, respectively), süssholz and lakritzenwurzel (in German), reglisse and bios doux (in French), shirin bayan and mak (in Persian), and licorice, liquorice, glycyrrhiza, sweet wood, and Liquiritiae radix (in English). Although it originated in the Mediterranean, this species is now found in China, Russia, and India. Presently,

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

the food and pharmaceutical industries, along with the production of functional foods and dietary supplements, employ the extracts (Hayashi & Sudo, 2009; Herrera, Herrera, & Ariño, 2009). Licorice has been used for traditional medicines and folk remedies for a very long time, dating back before the Greek and Roman eras. Indeed, varying temporal and geographic contexts correspond to varying applications (Armanini, Fiore, Mattarello, Bielenberg, & Palermo, 2002). The earliest known documents come from the ancient Egyptian, Chinese, Indian, and Assyrian civilizations. Licorice was mentioned as a medicinal plant and its therapeutic properties were described by Theophrastus and Pedanius Dioscorides (Armanini et al., 2002). For instance, the plant is frequently prescribed in traditional Chinese medicine to treat gastrointestinal issues, cough, bronchitis, and arthritis. Specifically, in traditional medicine, it is still widely used to treat tremors, respiratory infections, gastritis, and peptic ulcers. G. glabra root is often used to make a tea that works well as a thirst quencher. It has been said that the dried root cleanses teeth (Armanini et al., 2002). The manufacturing of food additives, such as flavors and sweeteners, is actually the most significant industrial application of G. glabra (Mukhopadhyay & Panja, 2008). The root is specifically used as a flavoring for chewing gum, candies, baked goods, ice cream, soft drinks, and American-style tobacco (Rizzato, Scalabrin, Radaelli, Capodaglio, & Piccolo, 2017). Root extracts are used as foaming agents in beers and fire extinguishers, while the root fibers are used in wallboard, boxboard, and insulation materials after the flavoring and medicinal ingredients are removed. G. glabra is used as a skin depigmentation agent in the cosmetic industry and is included in topical products for that reason. Regarding regulatory approval, the United States Food and Drug Administration, the Council of Europe, and the Joint FAO/WHO Expert Committee on Food Additives have all approved the use of liquorice extract and glycyrrhizin in food products (FAO, 2005). It is, in fact, considered generally safe by the U.S. Flavor and Extract Manufacturers Association.

To our knowledge, this plant has been the subject of very few reviews, especially when it comes to pharmacological aspects (Asl & Hosseinzadeh, 2008; Fiore, Eisenhut, Ragazzi, Zanchin, & Armanini, 2005). Examining G. glabra's bioactive compounds and the biological activities connected to them was the aim of this review.

Occurrence :-

It is known that several G. glabra strains produce pharmaceuticals [Trease and Evans 1983]. Reg. et al., G. glabra var. typica. The plant, which is roughly 1.5 meters tall, has publish-blue flowers. The subterranean portion, which can reach a depth of at least one meter, is made up of long roots and thin rhizomes or stolons. It is grown in Spain, Italy, England, France, Germany, and the USA and is the source of Spanish licorice. Russian licorice is derived from G. glabra var. glandulifera Wald. et Kit., which grows wild in Central and Southern Russia. The subsurface part is made up of a sizable root stock with many long roots but no stolons. Persian licorice, G. glabra var. B.violacea Bioss., has violet flowers. It can be found in the Tigris and Rip rates valleys, as well as in Iran and Iraq.

Microscopical study of Liquorice root :-

- The development of cork throws off the absence of the epidermis and most of the cortex.
- Ten rows of thin cork cells surround the outside of the unpeeled drug.
- A phelloderm, or secondary cortex, made up of parenchymatous cells—some of which may develop into collenchymatous cells—is found inside the cork.
- Simple starch grains and calcium oxalate prisms are found in certain cells.

Vernacular names of licorice :-

Sanskrit :--

Yastimadhu/Madhuk

Hindi :-

Mulethi, Mulaithi, Mithilakadi, Kubassussa

Gujrati :-

Jethi Madh

Bengali :-

Yastomadhu, Jashtimadhu, Jaishbomodhu

Tamil :-

Atimadhurama, Atimadhurappala

Marathi :-

Jyeshtamadh

Kannada:-

Samgara

Karnataki:-

Valliyashtimadhu

Punjabi:-

Mularthi

Oriya:-

Jatimadhu

Arab:-

Aslussiesa

Perisa:- Ausareha mahaka

German:-

Sussholz

Scientific name of licorice :-

Scientific Name:

Glycyrrhiza glabra, G. uralensis

Family:

Fabacaea (pea)

Taste:

Sweet

Plant Properties:

demulcent, antiviral, pectoral, anti-tussive, anti-inflammatory, laxative, immunomodulator, immunostimulant, hepatoprotective

Used for:

coughs, viral infections, eczema, constipation, inflamed mucus membranes, heartburn, ulcers, stress, fatigue, sore throat, "peacemaker" in formulas, hepatitis, asthma

Plant Preparations: pastille, tea, syrup, licorice root extract, candy, capsules, toothbrush

Biological source :-

Oil of licorice (Glycyrrhiza glabra L.), a perennial plant, is widely used as a natural flavoring and sweetener. Glycyrrhizin, its primary bioactive ingredient that gives it a sweet flavor, is also present, along with a few volatile compounds, flavonoids, and saponins.

CHEMICAL CONSTITUENTS LICORICE

- Glycyrrhizin (6–8%), which is available as a sweet that is 50 times sweeter than sucrose, is a white, crystalline powder made up of the glycynhizic acid salts potassium and calcium.
- Glycyrrhetic or glycyrrhetinic acid is produced during the hydrolysis of glycyrrhizic acid.
- A triterpenoid saponin with an a-amyrine structure is glycyrrhizinic acid.

Cultivation and collection :-

A deep, well-cultivated soil that retains moisture is necessary for the plant to produce healthy roots. Does best in sandy soil that receives lots of moisture; it does not do well in clay soil. The best growing conditions are slightly alkaline. The climate of the sea is ideal for the plant.

Propagation :-

How to Grow a Plant of Licorice. The licorice plant can be multiplied by root divisions, stem cuttings, and seeds. To prepare seeds, soak them in water for 24 hours in early spring in all but the warmest zones.

Traditional Uses :-

The benefits of licorice in treating coughs, colds, and chills were recognized by the ancient Greeks, Romans, and Egyptians. Due to the drugs' ability to quench thirst, licorice was prescribed for dropsy in the time of Hippocrates (Biondi et al. 2005). Although modern clinical use of licorice dates back to approximately 1930, its use for stomach and intestinal ulcers dates at least to the Greek physician Dioscorides in the first century AD. In the past, licorice was used by the Chinese for strength and endurance and the Hindus for increased sexual vigor. It was typically prepared in tea (Davis and Morris 1991). Licorice roots have been used in traditional medicine to treat a variety of conditions, including pancreatic disorders, Addison's disease, gastritis, pneumonia, bronchitis, arthritis, bronchial asthma, kidney diseases, heart diseases, gastric ulcer, mouth ulcers, coughs, swellings, excessive salivation, low blood pressure, allergies, upper respiratory tract catarrhs, liver toxicity, hyperglycemia, flatulence, sexual debility, skin diseases, leukorrhea, hoarseness, and certain viral infections (Blumenthal et al. 2000; Anon 2005; Armanini et al. 2002; Sharma et al. 2013). Present-day pharmacopoeias from Britain, Germany, and France generally concur on the uses of licorice in medicine.

Phytochemistry

Secondary metabolites and their derivatives, including alkaloids (Sarker and Nahar 2007; Varsha et al. 2013), glycosides (Firn 2010), flavonoids (Kar 2007; Varsha et al. 2013), phenolics (Cai et al. 2004; Puupponen-Pimiä et al. 2001), tannins (Kar 2007; Varsha et al. 2013), terpenes (Martinez et al. 2008), anthraquinones (Maurya et al. 2008; Vashist and Sharma 2013), essential oils (Martinez et al. 2008; Vashist and Sharma 2013), and steroids (Madziga et al. 2010; Varsha et al. 2013) are the main biologically active compounds. Sugars, starch, bitters, resins, tannins, essential oils, and inorganic salts are all present in licorice extract, along with small amounts of nitrogenous substances like proteins, specific amino acids, and nucleic acids (Hoffmann 1990; Isbrucker and Burdock 2006). Zhang and Ye (2009) state that over 400 compounds with broad biological activity have been isolated from species primarily consisting of flavonoids and triterpene saponins.

1. Flavonoids

Numerous species of Glycyrrhiza have been reported to contain more than 300 flavonoids (Herz et al. 1998; Li et al. 2000). Flavanones, chalcones, isoflavanes, isoflavenes, flavones, and isoflavones are among the frequently utilized flavonoid types (Lou and Qin 1995; Xing et al. 2003). Flavonoids like isoliquiritin and liquiritin give G. glabra its yellow hue (Yamamura et al. 1992). Liquiritin, liquiritigenin, 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 were among the flavonoids found in licorice (Zhang and Ye 2009). Flavonoid glycosides with feruloyl or coumaroyl groups and an indole conjugate were isolated by Hatano et al. (1998). From the crude extract of G.

uralensis Risch, Ma et al. (2005) isolated and identified the bioactive flavonoid compounds liquiritigenin and isoliquiritigenin. The structural isomer of licochalcone A has been identified as licochalcone C by Franceschelli et al. (2011). Numerous studies have also reported the presence of other flavonoids, including glyinflanin B, glycyrdione A, licoagrodin, and licoagrochalcones (Asl and Hosseinzadeh 2008; Christensen and Kharazmi 2001; Li et al. 2000). Glabridin and hispaglabridin B were found in an ethanolic extract of G. glabra roots by Gupta et al. (2008).

2.Saponins

Triterpenoid saponins (glycyrrhizic acid, glycyrrhizin) are the main components of liquorice that give it its sweet taste; they are found in the root of the glycyrrhiza plant (Blumenthal et al. 2000). The primary triterpenoid saponin in licorice root, glycyrrhizic acid, is also the herb's principal sweetener, 50 times sweeter than sugar (Nomura et al. 2002). It is thought that glycyrrhizin and its aglycone accelerate the healing process of stomach ulcers (Amirova 1993; Blumenthal et al. 2000). Animal studies have demonstrated the anti-inflammatory and anti-arthritic properties of glycoric acid (Amirova 1993). Other triterpenes, such as licorice acid, glabrolide, isoglaborlide, glycyrretol, and liquiditric acid, were described by Isbrucker and Burdock (2006).

3. Phenolic compounds

The phenolic components of Glycyrrhiza species have been the subject of numerous reports (Nomura and Fukai 1998). Liquiritin, isoliquiritin, apioside of liquiritin, isoprenoid-substituted flavonoids, chromenes, coumarins, and dihydrostilbenes are the primary phenols. Phenolic compounds from different species of Glycyrrhiza were studied by Nomura et al. (2002). They discovered flavonoids that were substituted with isoprenoid (pyranoisoflavan, glabridin) (G. glabra), isoflavans (G. uralensis), licochalcone A (G. inflate, G. eurycarpa), licoricidin (6), and licorisoflavan A (G. aspera). For instance, sigmoidin B in G. uralensis, isobavachin in G. pallidiflora, and liquiritigenin in Glycyrrhiza species have all been reported (Nomura and Fukai 1998).

4. Coumarins

Liqcoumarin, glabrocoumarone A and B, herniarin, umbelliferone, and glycyrin are among the coumarins that have been identified from G. glabra (Williamson 2003). Liqcoumarin, glabrocoumarone A and B, herniarin, umbelliferone, glycocoumarin, licofuranocoumarin, licopyranocoumarin, and glabrocoumarin were among the coumarins identified by Kinoshita et al. (2005) during their study of the plants. Recent research by Qiao et al. (2014) revealed that the root extract of G. uralensis contained glycerol, glycycoumarin, and dehydroglyasperin. Two coumarins from G. glabra, glycocoumarin and licopyranocoumarin, were shown by De Simone et al. (2001) to be able to prevent the formation of giant cells in HIV-infected cell cultures.

5. Oils and Other Compounds

Other secondary metabolites such as fatty acids, phenol, guaiacol, asparagines, glucose, sucrose, starch, polysaccharides, and sterols (β-sitosterol, dihydrostigmasterol) have also been found and reported by Näf and Jaquier (2006).

Citronellyl acetate, caryophyllene oxide, geranyl hexanolate, α-pinene, β-pinene, octanol, γ-terpinene, stragole, isofenchon, and β-caryophyllene were among the compounds discovered by Ali (2013) during her study of the essential oil composition of G. glabra. Among those compounds, β-pinene had the lowest percentage (1.7%), while geranyl hexanolate represents a higher percentage (34%). The phytoestrogens from the roots of G. glabra from Syria were identified by Khalaf et al. (2010) as daidzein, daidzin, genistin, ononin, glycitein, genistein, and coumestrol. Dihydrostilbenes were reported by Sultana et al. (2010) from the root extract of G. glabra cultivated in Sicily.

Pharmacological activity :-

The extracted or powdered materials derived primarily from roots and rhizomes are typically significant from a pharmacological standpoint. The names of the illnesses are shown schematically along with the corresponding bioactive compounds.

1. Antioxidant activity

One of the main benefits of using G. glabra is its antioxidant activity. The strong antioxidant activity noted is most likely due to the phenolic content (Rackova et al., 2007). While Singh et al. (2015) reported that isoflavones, including glabridin, hispaglabridin A, and 30-hydroxy-4-O–methylglabridin, are primarily responsible for this activity, Varsha and Sonam (2013) attributed this activity to flavonoids. The dihydrostilbene derivatives found in G. glabra leaves have a significant amount of antioxidant activity, according to Biondi, Rocco, and Ruberto's 2003 study. Additionally, G. glabra contains licochalcones B and D, which have been shown to have potent DPPH radical scavenging activity as well as the capacity to prevent microsomal lipid peroxidation (Biondi et al., 2003; V. Sharma, Katiyar, & Agrawal, 2016). These phenolic compounds can delay the onset of skin damage, which makes them useful for defending biological systems against oxidative stress (Haraguchi et al., 1998). Castangia et al. (2015) state that because liquorice extract has a high antioxidant content and counteracts oxidative stress damage, it may be useful in topical applications for innovative dermal and cosmetic products. The most significant studies on antioxidant activity are compiled in Table 1.

.2. Anti-inflammatory activity

Since ancient times, G. glabra has been used to treat inflammatory diseases due to its documented anti-inflammatory activity (R. Yang, Yuan, Ma, Zhou, & Liu, 2017). Following four weeks of feeding, Shalaby, Ibrahim, Mahmoud, and Mahmoud (2004) assessed G. glabra's anti-inflammatory activity in male rats. The levels of serum liver enzymes, triglycerides, and total cholesterol all significantly decreased, according to the authors' observations. In their 2011 review, Harwansh, Patra, Pareta, Singh, and Biswas examined the benefits of G. glabra in the management of disorders affecting the upper respiratory tract and the digestive system. According to Bahmani et al. (2014), these pharmacological effects resulted from an increase in prostaglandin and serotonin secretion in the stomach, which decreased gastric inflammation. Various authors have reported that glycyrrhizin plays a primary mediating role in the anti-inflammatory action. In vitro, this compound has the ability to inhibit inflammatory factors and facilitate the healing of mouth and stomach ulcers (Rackova et al., 2007; Yin et al., 2017).

3. Antitussic and expectorant activity

Several authors have documented liquorice's expectorant and antitussic properties, highlighting its potential benefits in managing bronchial catarrh, cough, and sore throat (Damle, 2014; Fiore et al., 2005). Glycyrrhizin, which promotes tracheal mucus secretion and aids in clearing congestion in the upper respiratory tract, is linked to these effects (V. Sharma et al., 2016). Similarly, capsaicin, a substance that causes coughing, can be inhibited by liquiritin apioside, an active ingredient found in liquorice's methanolic extract (Kamei, Nakamura, Ichiki, & Kubo, 2003). The impact on sore throat has been likened to that of carbenoxolone, a derivative of glycyrrhetinic acid with a structure resembling a steroid that promotes the secretion of mucus from the stomach (Damle, 2014).

4. Antiulcerative activity

It is commonly known that G. glabra extract has antiulcerative properties. It is used to treat gastric and duodenal ulcers in the gastrointestinal tract (Bardhan, Cumberland, Dixon, & Holdsworth, 1978); however, it is also used as an adjuvant to treat spasmodic pain associated with chronic gastritis (Armanini et al., 2002). Since the 1970s, G. glabra has been used to treat duodenal and peptic ulcers; this traditional use is associated with the plant's anti-inflammatory saponins (Krausse et al., 2004). The primary substance in charge of this action is glycyrrhizin, which can increase the amount of prostaglandins in the digestive system and encourage the secretion of stomach mucus (Jafarian & Ghazvini, 2007). Furthermore, liquorice has an antipepsin effect by extending the life of stomach surface cells (Ram, Lachake, Kaushik, & Shreedhara, 2010).

5. Antimicrobial Activity

Several writers have documented the antimicrobial activity of G. glabra against Mycobacterium tuberculosis (Gupta et al., 2008), indicating that glabridin, rather than hispaglabridin B, is the compound accountable for this activity (Simmler et al., 2013). Licoisoflavone and licochalcone A were previously identified as the antitubercular phenolic compounds (Chakotiya, Tanwar, Srivastava, Narula, & Sharma, 2017). Due to the presence of glabridin, licochalcone, ergosterol, stigmasterol, and hydroalcoholic extract, the microbial load in the blood was reduced in a mice lung infection model where G. glabra was therapeutically active against a multidrug-resistant strain of P. aeruginosa (Chakotiya et al., 2016).

SIDE EFFECTS AND TOXICITY :-

High doses of G. glabra have been linked to a variety of unfavorable side effects, including fluid retention, hypokalaemia, and hypertension (Omar et al., 2012). High glycyrrhizin exposure can have effects similar to those of hypermineralocorticoids. The 11β-hydroxysteroid dehydrogenase enzyme can be inhibited by glycyrrhetic acid and liquorice saponins, which can result in a mineralocorticoid effect induced by cortisol and a tendency toward sodium elevation and potassium reduction (Isbrucker & Burdock, 2006). For instance, it was suspected in 2010 that a 34-year-old woman consumed liquorice over several months, resulting in a lethal acute intoxication (Albermann et al., 2010). Albermann et al. measured the levels of these compounds in the blood using liquid chromatography–tandem mass spectrometry and linked the effects to the possible mineralocorticoid action of glycyrrhizin and its metabolite, glycyrrhetic acid. However, the woman who passed away had only trace amounts of glycyrrhetic acid in her stomach contents and blood, ruling out the possibility of acute, fatal glycyrrhetic acid intoxication (Albermann et al., 2010).

Traditional uses :-

The small perennial herb licorice, Glycyrrhiza glabra L., has long been used to treat a wide range of illnesses, including fever, sexual debility, rheumatism, stomach ulcers, respiratory conditions, hyperdipsia, epilepsy, hemorrhagic diseases, paralysis, and jaundice.

CONCLUSION :-

This review provided a thorough understanding of G. glabra's phytochemical makeup and pharmacological properties. This plant is widely used in traditional medicine and as an ingredient in food products, especially as a flavoring and sweetener. The roots are used to treat and prevent a number of side effects, including inflammation of the skin, cancer, and microbial and viral infections. With flavonoids accounting for the majority of biological activities, they are the most significant of the bioactive compounds. Numerous phytochemicals have been identified and linked to the biological activities reported, such as hepatoprotection, antioxidant, antiviral, antimicrobial, and anti-inflammatory properties, as well as glabrin A and B, glycyrrhizin, and 18β-glycyrrhetinic acid. In general, these practices align with conventional wisdom and folk medicine. Licorice does have some toxic side effects, but they are primarily related to hypertension and fluid retention. Except for a few isolated ones, not many studies have been done on this specific theme to date. As a result, side effects are still a topic for possible future research. This review describes and clarifies the plant's traditional use while also highlighting its potential applications in other industries, like the pharmaceutical or cosmetic ones. There should be more clinical trials conducted to provide new uses a scientific foundation.

REFERENCES :

1. Ahn, J. , Lee, H. , Jang, J. , Kim, S. , & Ha, T. (2013). Anti-obesity effects of glabridin-rich supercritical carbon dioxide extract of licorice in high-fat-fed obese mice. Food and Chemical Toxicology, 51, 439–445. [](Google Scholar)
2. S.-J. , Song, Y.-D. , Mah, S.-J. , Cho, E.-J. , & Kook, J.-K. (2014). Determination of optimal concentration of deglycyrrhizinated licorice root extract for preventing dental caries using a bacterial model system. Journal of Dental Sciences, 9(3), 214–220. (Google Scholar)
3. S. L. , Battur, H. , Shamarao, S. , Sivakumar, V. , Patil, P. U. , & Shanavas, P. (2014). Effect of aqueous and alcoholic licorice (Glycyrrhiza glabra) root extract against Streptococcus mutans and Lactobacillus acidophilus in comparison to chlorhexidine: An in vitro study. Journal of International Oral Health, 6(4), 29–34. [PMC free article] [PubMed] (Google Scholar)
4. Albermann, M. E. , Musshoff, F. , Hagemeier, L. , & Madea, B. (2010). Determination of glycyrrhetic acid after consumption of liquorice and application to a fatality. Forensic Science International, 197(1), 35–39. [PubMed]
5. Armanini, D. , Fiore, C. , Mattarello, M. J. , Bielenberg, J. , & Palermo, M. (2002). History of the endocrine effects of licorice. Experimental and Clinical Endocrinology & Diabetes, 110(06), 257–261. [PubMed] [Google Scholar]
6. Asha, M. K. , Debraj, D. , Prashanth, D. , Edwin, J. R. , Srikanth, H. S. , Muruganantham, N. , … Agarwal, A. (2013). In vitro anti-Helicobacter pylori activity of a flavonoid rich extract of Glycyrrhiza glabra and its probable mechanisms of action. Journal of Ethnopharmacology, 145(2), 581–586. [PubMed] [Google Scholar]
7. Asl, M. N. , & Hosseinzadeh, H. (2008). Review of pharmacological effects of Glycyrrhiza sp. and its bioactive compounds. Phytotherapy

HOW TO CITE: Jayesh D. Phalake , Prachi Mahamuni, K.V. Otari, Review on Licorice Plant (*Jaist Madhu*), Int. J. of Pharm. Sci., 2024, Vol 2, Issue 5, 1670-1677. https://doi.org/10.5281/zenodo.11386182