

A REVIEW ON YASHTIMADHU (GLYCYRRHIZA GLABRA) – AN EXCELLENT MEDICINAL PLANT FOR THE FUTURE

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ABSTRACT

Yashtimadhu (*Glycyrrhiza glabra*) a potent medicinal herb which was described in ayurveda, cures varieties of ailments from simple cough to more complex diseases like hepatitis, cancer etc. It is reported to contain important phytoconstituents such as glycyrrhizin, glycyrrhetic acid, glycyrrhizic acid, asparagin, liquirtin, glabrin A&B, flavonoids and isoflavonoids. It has multifaceted pharmacological actions like anti-tussive, anti-inflammatory, anti-ulcer, anti-oxidant, anti spasmotic, expectorant, anti-biotic, anti-viral, anti-arthritis, anti-diuretic and anti hyperglycemic agent. The present

article is an effort to compile its major pharmacologic activities and highlight the role of flavonoids and isoflavonoids in alleviating the pain. This may be useful in discovering potential therapeutic effects and developing new formulations.

KEYWORDS: Yashtimadhu, *Glycyrrhiza glabra*, glycyrrhizin, anti-tussive, anti-oxidant, anti-biotic etc

INTRODUCTION

Medicinal plants are of great importance to the health of individuals and communities. The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plants are triterpenoid saponin, flavonoids, tannins, alkaloids, phenolic compounds.^[1]

Glycyrrhiza is derived from the ancient Greek term *glykos*, meaning sweet and *rhiza*, meaning root.

Habitat

Glycyrrhiza glabra, also known as liquorice and sweet wood, is native to the Mediterranean and certain areas of Asia. In India its habitat is Jammu & Kashmir, Punjab and Sub-Himalayan tracts. Historically, the dried rhizome and root of this plant were employed medicinally by the Egyptian, Chinese, Greek, Indian, and Roman civilizations as an expectorant and carminative.

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.^[2]



Figure 1: Plant of *Glycyrrhiza glabra* Figure 2: Roots of *Glycyrrhiza glabra*

SCIENTIFIC CLASSIFICATION

Kingdom: Plantae

Division: Angiospermae

Class: Dicotyledoneae

Order: Rosales

Family: Leguminosae

Genus: *Glycyrrhiza*

Species: *glabra* Linn

Binomial Name: *Glycyrrhiza glabra* L.

VERNACULAR NAMES^[3]

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

Properties^[4]

Rasa	:	Madhura
Guna	:	Guru, Snigdha
Veerya	:	Seeta
Vipaka	:	Madhura
Karma	:	Vatapittahara, Vranaropana, Sothahara, Vedanasthapana, Balavarnakara, Chakshushyam, Trishnanigraha, Chardinigraha, Vishahara, Sothahara, Swaryam, keshyam.

Part used: Roots

Phytochemical constituents

The roots of *Glycyrrhiza glabra* Linn contain glycyrrhizin, a saponin glycoside which constitutes 10-25% of licorice is considered as the primary active ingredient. It is 60 times sweeter than cane sugar. Flavonoid rich fractions include liquirtin, isoliquertin liquiritigenin and rhamnoliquirililn and five new flavanoids were isolated from dried roots.^[5,6] A new prenylated isoflavan derivative kanzonol R was also isolated.^[6]

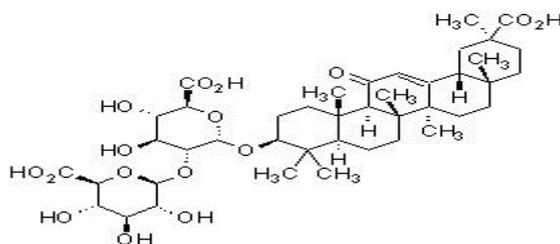


Figure 3: Chemical structure of glycyrrhizin

Quantitative standards.^[7, 8]

Total ash =Not more than 10%, Acid insoluble ash=Not more than 25%, Sulfated ash= Not more than 10%, Water soluble extractive=Not less than 20%, Diluted alcohol-soluble extract= Not less than 10%, Moisture=5.25%, Ether extracts=16.85%, Albuminoids=37.00% (containing nitrogen 5.92%), Soluble carbohydrates=31.00%, Woody fiber=5.05%, Ash=4.80% (containing sand 0.25%).

Traditional Uses

Effectiveness of glycyrrhizin in the treatment of chronic hepatitis and liver cirrhosis is proved^[9]. *Glycyrrhiza glabra* is considered as one of the best remedies for relieving pain and other symptoms such as discomfort caused by acrid matter in the stomach. It alleviates the irritating effects of acids in a better way than alkalis.^[10] It is an excellent tonic and is also used as demulcent in catarrh of the genitourinary passages.^[11] *The British Herbal Compendium* indicates the use of liquorice for bronchitis, chronic gastritis, peptic ulcer, rheumatism and arthritis, adreno corticoid insufficiency, and to prevent liver toxicity. *In Japan*, glycyrrhizin has been used for more than 60 years as treatment for chronic hepatitis under the name of Stronger Neo- Minophagen C (SNMC) clinically as an anti-allergic and antihepatitis agent.^[12] Topical preparations, containing *glycyrrhetic acid*, are used for *herpes, eczema, and psoriasis* [Source: Indian Medicinal Plants]. It is helpful in relieving fevers and soothing pain such as headaches, abdominal pain with its aspirin-like action.

Pharmacological actions: *Indian Herbal Pharmacopoeia* recognizes its use as an anti-inflammatory and antiulcer agent.^[8]

Antiulcer

A special liquorice extract known as *DGL (deglycyrrhizinated liquorice)* can be used in the treatment of *peptic ulcer*^[3]. *Glycyrrhiza glabra* has significant role in the healing of *Helicobacter pylori* infected *peptic ulcer*.^[14]

Anti-tussive & expectorant

The liquorice powder and extract was found to be effective in treatment of sore throat, cough and bronchial catarrh. The specific mechanism of action is not known. Liquorice decreases irritation and produces expectorant effects. Carbenoxolone (a semi synthetic compound derived from *Glycyrrhiza*) stimulates gastric mucus secretion. Likewise, liquorice extract

may also be able to stimulate tracheal mucus secretions producing demulcent and expectorant effects.^[15]

Antioxidant

High content of phenolic component in ethanolic extract of Liquorice (*Glycyrrhiza glabra L*) is responsible for its powerful antioxidant activity by means of significant free radical scavenging, hydrogen-donating, metal ion chelating abilities.^[16]

Skin Whitening activity

Ethanolic extract of *Glycyrrhiza glabra* is reported to show improvement in the viscoelastic and hydration properties of the skin. Synergistic effect of UV protective, antioxidant and anti-inflammatory properties of liquorice extract might be responsible for giving beneficial effects on skin.^[17]

AntiInflammatory

It is reported that glycyrrhetic acid in liquorice extract gives anti-inflammatory effect similar to glucocorticoids and mineralocorticoids.^[32] Carbenoxolone (Biogastron), a glycyrrhetic acid analog, is reported to inhibit two enzymes that are important in metabolism of prostaglandin, 15-hydroxyprostaglandin dehydrogenase and $\Delta 13$ prostaglandin thereby raising prostaglandin levels. Prostaglandins stimulate mucous secretion and cell proliferation. Thus, ulcer healing is promoted.^[18]

Anti carcinogenic

PDQ cancer information summary has current information about the use of PC-SPES in the treatment of people with *prostate cancer* as a dietary supplement . PC-SPES is a mixture of 8 herbs. *Glycyrrhiza glabra* is one among them. Evidence from clinical trials has shown that PC-SPES lowers PSA and testosterone levels in humans.^[19]

Anti viral and Hepato protective

Glycyrrhiza glabra as Complementary and alternative therapy in the treatment of *chronic hepatitis C* showed significant improvements in virological and/or biochemical response.^[20]

Anti-bacterial

Because of the presence of secondary metabolites such as; saponins, alkaloids, flavonoids in hydro-methanolic root extract of *Glycyrrhiza glabra*, the extract exhibits potent antibacterial activity.^[21]

Memory Enhancing

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. But, the exact mechanism of action is unknown and needs further investigation.^[22]

Hair growth stimulation

The 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]

Probable mode of Analgesic action

In a study on *Anthocephalus chinensis*(Lam) it is reported that the plasma membrane of cells mediates variety of sensations like pain, hotness, coldness etc. and the TRP and TRPV1 receptors present on the cell membrane will be responsible for the transduction of pain sensation. The flavonoids and their analogs present in *Anthocephalus chinensis* will work as TRPV1 antagonist and block the transduction through the cell membrane.^[24] *Glycyrrhiza glabra* also contains flavonoids and isoflavonoids.^[5,6], which may work as TRPV1 antagonist and may block the transduction channel of the receptors of pain sensation in the lining membrane. This was proved by earlier study on *Anthocephalus chinensis* (Lam).

Side Effects and Toxicity

One of the most common reported side effects with licorice supplementation is elevated blood pressure due to the effect of licorice on the rennin-angiotensin-aldosterone system. In addition to this patient may experience hypokalemia and sodium retention, resulting in edema. All symptoms usually disappear with discontinuation of therapy.^[25] Many studies report no side effects during the course of treatment.^[26,27] Generally the onset and severity of symptoms depend on the dose and duration of licorice intake, as well as individual susceptibility. Patients with delayed gastrointestinal transit time may be more susceptible to these side effects, due to enterohepatic cycling and re-absorption of licorice metabolites. The amount of licorice ingested daily by patients with mineral-corticoid excess syndromes appears to vary over a wide range, from as little as 1.5g daily to as much as 250g daily.^[28]

Dosage

A daily intake of 1-10mg of glycyrrhizin, which corresponds to 1-5gms licorice has been estimated to be a safe dose for most healthy adults.^[29]

CONCLUSION

Yashtimadhu (*Glycyrrhiza glabra* Linn) is a plant with ethnopharmacological importance. The present review was focused on pharmacological activities of liquorice and mainly on its ability of alleviating pain. The review would help in further studies on *Glycyrrhiza glabra* Linn for exploring its potential in treating diseases.

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