



PHYSICOCHEMICAL AND PRELIMINARY PHYTOCHEMICAL STUDIES ON THE RHIZOMES
OF *GLYCYRRHIZA GLABRA* LINN

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ABSTRACT

The present communication attempts to evaluate the physicochemical and preliminary phytochemical studies on the roots of *Glycyrrhiza glabra* Linn Leguminosae family. *Glycyrrhiza glabra* is a hardly herb or undershurb of pea family, found in subtropical and warm temperate regions. It is up to four or five feet, *Glycyrrhiza glabra* is widely distributed in Mediterranean countries, South Europe, Asia Minor, Egypt, Turkistan, Iran and in India, it is reported to be cultivated in Baramulla, Srinagar, Jammu, Dehradun, Delhi and South India. The rhizomes are considered to possess an expectorant and carminative, flavouring agent, depressant, antimicrobial, hypolipidemic, antianthersclerotic, antiviral, hypotensive, hepatoprotective, spasmolytic, antidiuretic, antimutagenic, antipyretic, anti-inflammatory. As there is no detailed standardisation work reported on rhizome, the physicochemical parameters, preliminary phytochemical constants, toxic heavy metals, pesticide residue, aflatoxin and microbial contamination analysis are carried out. The study revealed specific identities for the particular crude drug which will be useful in identification and control to adulterations of the raw drug.

Keywords: *Glycyrrhiza glabra* Linn., Toxic metals, physicochemical studies, Aflatoxin.

INTRODUCTION

Since origin of human's life, plants continue to play a curative and therapeutic role in preserving human health against disease and decay. The widespread use of herbal remedies and healthcare preparations, such as those described in ancient texts like the Vedas and the Bible have been traced to the occurrence of natural products with medicinal properties^{1,2}. In this context, India being a subtropical country is a good repository of plants that are widely used in the preparation of herbal therapies.

Glycyrrhiza glabra is a hardly herb or undershurb of pea family, found in subtropical and warm temperate regions. It is up to four or five feet, oval leaflets, leaves multifoliate, imparipinnate, flowers in axillary spikes, papilionaceous, lavender to violet in colour, pods compressed, containing reinform seeds, white to purplish flower clusters, an extensive root system with a main taproot and numerous runners. The main taproot, which is harvested for medicinal use, is soft, fibrous, and has a bright yellow interior.

Glycyrrhiza glabra Linn, commonly known as liquorice and sweet wood belonging to Leguminosae family, It is known as Jothi-madh in Hindi, Yashti-madhuh, Madhuka in Sanskrit, Jashtimadhu, jashbomodhu in Bengali, Atimadhuranu, Yashtimadhukam in Telugu, Jethimadhu in Gujarati and Atimaduram in Tamil³.

It has been long known for its medicinal value. *Glycyrrhiza glabra*, is widely distributed in Mediterranean countries, South Europe, Asia Minor, Egypt, Turkistan, Iran, and in India, it is reported to be cultivated in Baramulla, Srinagar, Jammu, Dehradun, Delhi and South India. There are several well-marked species: *Glycyrrhiza glabra*, *glandulifera*, *echinata*, etc. The chief source of the drug is *Glycyrrhiza glabra*, which is cultivated in England. Liquorice grows best on sandy soil near streams, usually not being found in the wild condition more than 50 yards from water. The rhizomes are considered to possess an expectorant, carminative, antimicrobial, hypolipidemic, anti-anther sclerotic, antiviral, hypotensive hepatoprotective, spasmolytic, anti-diuretic, anti-mutagenic, antipyretic and anti-inflammatory.

The roots are sweet, refrigerant, emetic in large dose, tonic, mild laxative, aphrodisiac, haemostatic. They are useful in hyperdipsia, cough, bronchitis, ulceration of urinary tract, pharyngitis, epilepsy,

anaemia. In the ayurvedic system of medicine it is used in the preparations of yashtyadi churna, Yashtimadhvadya taila, Brihat ashwagandha ghrita, Pippalydi taila, Vridhihara lepa. *Glycyrrhiza glabra* Linn has threats due to harvest for medicines loss of habitat and trade. The important adulterants of *Glycyrrhiza glabra* are the roots of *Glycyrrhiza Fisch.* (Manchurian liquorice) and *Abrus precatorius* Linn⁴⁻⁶. *Glycyrrhiza glabra* Linn contains triterpene saponins, flavonoids, polysaccharides, pectins, simple sugars, amino acids, mineral salts, and various other substances⁷. Glycyrrhizin, a triterpenoid compound, accounts for the sweet taste of *Glycyrrhiza glabra* Linn root. The yellow color of *Glycyrrhiza glabra* Linn is due to the flavonoid content of the plant, which includes liquiritin, isoliquiritin (a chalcone), and other compounds⁸. The isoflavones glabridin and hispaglabridins A and B have significant antioxidant activity⁹ and both glabridin and glabrene possess estrogen-like activity¹⁰.

Glycyrrhetic acid is 200-1,000 times more potent an inhibitor of 11- β -hydroxysteroid dehydrogenase (involved in corticosteroid metabolism) than glycyrrhizic acid¹¹. Glycyrrhizin and glycyrrhizic acid have been shown to inhibit growth and cytopathology of numerous RNA and DNA viruses, including hepatitis A and C¹²⁻¹⁴, HIV^{15,16}, Herpes simple and CMV¹⁷⁻¹⁹. Glycyrrhizin and its metabolites inhibit hepatic metabolism of aldosterone and suppress 5- β -reductase²⁰. *In vitro* research has also demonstrated glycyrrhizic acid inhibits cyclooxygenase activity and prostaglandin formation (specifically prostaglandin E2), as well as indirectly inhibiting platelet aggregation, all factors in the inflammatory process²¹. Glycyrrhizin and glabridin inhibit the generation of reactive oxygen species by neutrophils at the site of inflammation^{22, 23}. *In vitro* studies have demonstrated licorice isoflavones, hispaglabridin A and B, inhibit Fe³⁺ induced mitochondrial lipid peroxidation in rat liver cells^{24,25}. Therefore, the present paper attempts to evaluate the physicochemical parameters, preliminary phytochemical screening and heavy metal analysis of the rhizome for identification of the drug in dry form and control the adulterants.

RESULTS AND DISCUSSION

Rhizome of the *Glycyrrhiza glabra* Linn was collected and analysed the various standardisation parameters. Preliminary phytochemical results showed the presence or absence of certain phytochemicals in the drug. The tests performed using n-Hexane, Chloroform, Ethyl

acetate, alcoholic and water extracts. Phytochemical test revealed the presence, Alkaloid, triterpene, saponins, flavonoids, polysaccharides, Steroid, Tannin and results are given in Table 1.

Table 1: Preliminary phytochemical tests for different solvent extract of rhizome for *Glycyrrhiza glabra* Linn

S. No.	Natural product	Test performed	Result
1.	Alkaloid	Dragendorff's test	+ve
2.	Coumarin	Alkaline test	+ve
3.	Flavone	Shinoda test	+ve
4.	Steroid	Liebermann-Burchard reagent	+ve
5.	Tannin	Neutral FeCl ₃	+ve
6.	Glycoside/Sugar	Molisch's test	+ve
7.	Terpenoid	Noller's test	+ve
8.	Saponin	NaOH solution	+ve

Table 2: Physico-chemical parameters of rhizome of *Glycyrrhiza glabra* Linn.

Parameters	Results
Description	Greenish brown
Loss on drying at 105 °C	7.67% w/w
Total Ash	7.92 % w/w
Acid-insoluble ash	0.62 % w/w
Water-soluble extractive	25.69 % w/w
Alcohol-soluble extractive	23.37 % w/w
pH (10 % w/v aqueous suspension)	5.52
Particle size	
Passing through 40 mesh size sieve	89.91 % w/w
Passing through 18 mesh size sieve	99.55 w/w
Bulk density	0.4207gm/ml
Tap density	0.6311 gm/ml
Heavy metals	
Mercury	0.703 ppm
Lead	0.021 ppm
Cadmium	Less than 0.001 ppm
Arsenic	Less than 0.001ppm
Microbial contamination	
Test for E.coli/g	Absent
Test for Salemonella/g	Absent
Test for S. aureus/g	Absent
Total viable count/g	207510 cfu/gm
Total fungal count/g	19762 cfu/gm
Total enterobacteriaceae/g	Absent

The presence of four heavy metals namely Arsenic, Mercury, Cadmium, Lead and microbial contamination were analysed in the sample and the results are shown in Table 2. The concentration of all the heavy metals and microbial contamination were below the WHO/FDA permissible limits²⁶⁻²⁷. The presence of pesticide residue organochlorine pesticide, organophosphorous pesticides and Pyrethroids were not detected in the plant samples.

Physio-chemical parameters of the root of *Glycyrrhiza glabra* Linn are tabulated in Table 2. The pH value of 10% w/v aqueous solution is acidic. Deterioration time of the plant material depends upon the amount of water present in plant material. If the water content is high, the plant can be easily deteriorated due to fungus. The loss on drying at 105°C in root was found to be 7.67 %. Total ash value of plant material indicated the amount of minerals and earthy materials attached to the plant material. Analytical results showed total ash value content was 7.92 %. The negligible amount of acid-insoluble siliceous matter present in the plant was 0.62%. The water-soluble extractive value was indicating the presence of sugar, acids and inorganic compounds. The alcohol soluble extractive values indicated the presence of polar constituents like phenols, alkaloids, steroids, glycosides, flavonoids the results given in Table 2²⁷.

Thin layer chromatographic technique was used to separate the chemical compounds present in the drug. Various solvent systems were checked to separate the maximum number of chemical compounds in the drug.

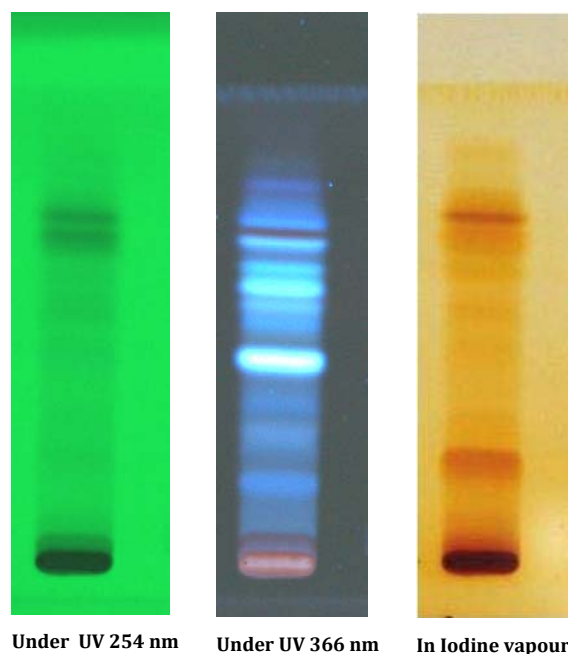


Fig. 1: TLC Profile rhizome of *Glycyrrhiza glabra* Linn

TLC of the ethanol extract developed in the mobile phase of Toluene: Ethyl acetate: Acetic Acid :: 5.0 : 4.2 : 0.8 (Figure. 1) and observed under UV 254 nm 5 spots at R_f value 0.22,0.44,0.54,0.69, and 0.70 (green colour) under UV 366 nm showed 12 spots at R_f 0.06,0.18,0.28,0.35,0.43,0.50,0.54,0.58,0.63,0.67,0.72 and 0.79 (blue), and after derivatization with iodine, showed 8 spots at R_f 0.22, 0.31, 0.46, 0.53, 0.62, 0.68, 0.73 and 0.86.

CONCLUSION

Preliminary phytochemical as well as various aspects of the rhizome sample were studied and described along with, physico-chemical, toxic heavy metal, microbial contaminants, aflatoxin and TLC studies in authentication adulteration for quality control of raw drugs. Rhizome of *Glycyrrhiza glabra* Linn exhibits a set of diagnostic characters, which will help to identify the drug in dried condition.

It has been concluded from this study that estimation of heavy metals and pesticides residue, aflatoxin and microbial contamination is highly essential for raw drugs or plant parts used for the preparation of compound formulation drugs. The periodic assessment is essential for quality assurance and safer use of herbal drugs.

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