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Review Article

To In Vitro Assessment and Evaluation Liquorice Root Extract for Antacid Activity

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ABSTRACT

Gastroesophageal reflux disease and peptic ulcers are common gastrointestinal disorders often treated with synthetic antacids. However, prolonged use of these agents can lead to adverse effects, prompting the search for safer, plant-based alternatives. In this study, the in vitro antacid activity of liquorice (Glycyrrhiza glabra) root extract was evaluated using a simulated gastric acid neutralization model. The extract was prepared using hydroalcoholic solvent extraction and subjected to phytochemical screening, revealing the presence of flavonoids, glycyrrhizin, and saponins—compounds known for gastroprotective effects. The neutralization capacity of the extract was assessed by titration against 0.1 N hydrochloric acid and compared with standard antacid formulations. Results demonstrated that liquorice root extract exhibited significant acid-neutralizing activity, suggesting its potential as a natural antacid agent. These findings support further investigation into the clinical efficacy and safety of liquorice-based formulations for the management of acid-related gastrointestinal conditions.

INTRODUCTION

Liquorice root (Glycyrrhiza glabra), a plant native to parts of Asia and the Mediterranean, has been used for centuries in traditional medicine systems such as Ayurveda, Traditional Chinese Medicine (TCM), and Unani. It is widely recognized for its diverse therapeutic benefits, particularly in the treatment of respiratory, inflammatory, and gastrointestinal disorders. Among its many medicinal uses, liquorice root has gained significant attention for its anti-acid and antiulcer activity, making it a valuable natural option in managing acid-related gastrointestinal conditions like gastric ulcers, gastroesophageal reflux disease (GERD), and dyspepsia. The gastro protective effects of liquorice root are primarily attributed to its rich composition of bioactive compounds. The most well-known of these is glycyrrhizin, a triterpenoid saponin that possesses potent anti-

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inflammatory, antioxidant, and mucosal-protective properties. Glycyrrhizin and its aglycone form, glycyrrhetinic acid, have been shown to promote healing of the gastric mucosa by enhancing the production of protective mucus and bicarbonate, stimulating epithelial cell regeneration, and inhibiting gastric acid secretion. In addition to glycyrrhizin, liquorice contains a variety of flavonoids, such as liquidity and isoliquiritigenin, which further contribute to its antioxidant and cytoprotective effects. One of the primary mechanisms through which liquorice exerts its antiulcer effect is by strengthening the gastric mucosal defence system rather than neutralizing stomach acid directly, as seen with conventional antacids. This mucosal protection involves up regulation of prostaglandin synthesis, inhibition of leukotriene formation, and modulation of inflammatory cytokines, thereby reducing tissue damage and promoting ulcer healing. Moreover, liquorice has been found to have antimicrobial activity against Helicobacter pylori, a key bacterium implicated in the development of peptic ulcers and chronic gastritis.



FIG.NO. 1.1: LIQUORICE ROOT

To reduce the risk of side effects associated with prolonged use of glycyrrhizin, such as hypertension, water retention, and hypokalemia, a modified form known as deglycyrrhizinated liquorice (DGL) is often used in clinical settings. DGL retains the beneficial components of liquorice that support mucosal healing without the mineralocorticoid-like side effects of glycyrrhizin. Studies have demonstrated the efficacy of DGL in treating both gastric and duodenal ulcers, with improved outcomes in symptom relief and ulcer resolution when compared to placebo.



FIG.NO 1.2: LIQUORICE PLANT

In conclusion, liquorice root offers a multifaceted approach to gastrointestinal protection through its anti-inflammatory, antioxidant, antimicrobial, and mucosal-enhancing properties. Unlike conventional antacids that provide temporary relief by neutralizing acid, liquorice works to enhance the body's natural defence mechanisms, making it a promising complementary or alternative treatment for acid-related disorders. However, care must be taken in dosing and formulation, particularly when using whole liquorice extracts, to avoid potential adverse effects. Continued research and clinical trials are needed to further elucidate optimal usage strategies and to standardize liquorice based therapies for broader therapeutic application.

ACIDITY:-

- Acidity is also referred to as acid reflux. It is a common medical condition caused due to excessive production of acid by the stomach, which



Fig.No.1.4 : Trigger Factor

- Flows back into the food pipe and causes pain or burning sensation in the lower chest area. According to nutritionists, poor food habits and an unhealthy lifestyle are responsible for acidity in individuals.



Fig.No.1.5: Hyper Acidity

The main causes of the acidity are:

- Stress
- Obesity
- Lack of physical activities
- Irregular and poor eating habits
- Eating spicy and oily foods
- Smoking and use of tobacco product
- Resting or lying down right after a meal
- Intake of more alcohol, carbonated drinks, coffee, and tea

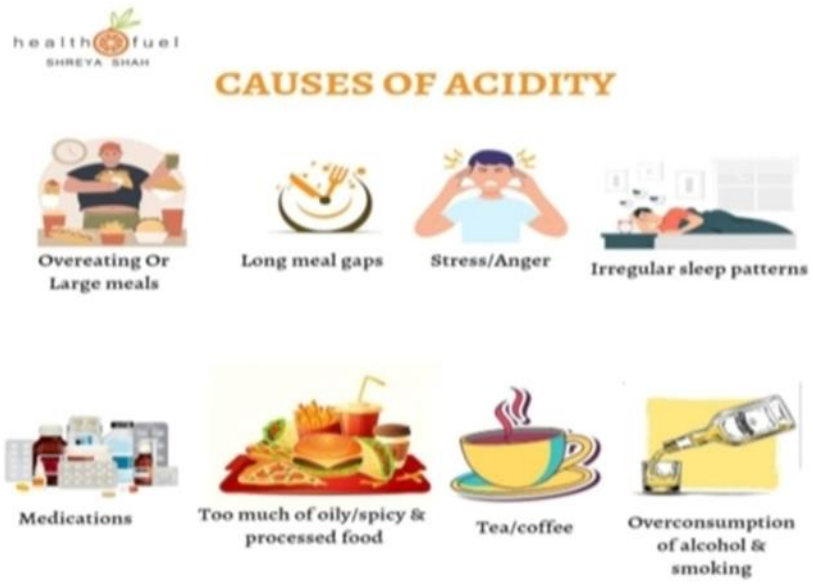


Fig.No.1.6: Causes Of Acidity

Acidity Symptoms:

Following are the important acidity symptoms: Nausea

- Heartburn
- Bad Breath
- Indigestion
- Constipation
- Restlessness
- Regurgitation
- Inflammation
- Stomach ulcers
- Excessive vomiting
- Sour taste in the mouth
- Difficulty swallowing
- Burning sensation in the stomach and throat.

The stomach produces gastric acids that help in digesting food. However, due to some causes, there are times when gastric acids are produced in excess, leading to acidity. Factors affecting the function of the lower oesophageal sphincter (LES) are also responsible for acid reflux.

There are few simple tips and tricks that can help you to prevent and manage acidity. These include:

1) Eat small, frequent meals
2) Eat a low-carb diet
3) Chew your food properly
4) Avoid eating late at night
5) Limit consumption of spicy and deep-fried food
6) Limit caffeine and carbonated beverages intake
7) Limit your alcohol intake
8) Quit smoking.

Pharmacological Actions of Liquorice Root

Liquorice root exhibits a wide spectrum of pharmacological effects due to its rich content of bioactive compounds such as glycyrrhizin, flavonoids, saponins, and chalcones. These compounds work synergistically to exert therapeutic benefits in various organ systems.

1. **Anti-ulcer and Gastro protective Activity**

- **Mechanism**: Increases mucus and bicarbonate secretion, enhances prostaglandin synthesis, and inhibits H. pylori.
- **Key Compound**: Glycyrrhizin and flavonoids.
- **Effect**: Protects and heals the gastric mucosa, reduces gastric acid secretion, and promotes ulcer healing.
- **Clinical Use**: Peptic ulcers, GERD, gastritis.

2. **Anti-inflammatory Activity**

- Mechanism: Inhibits COX-2 and LOX pathways, reduces pro-inflammatory cytokines (e.g., TNF-α, IL-6).
- Key Compounds: Glycyrrhizin, glabridin, isoliquiritigenin.
- Effect: Reduces inflammation in conditions such as arthritis, eczema, and inflammatory bowel disease.

3. **Antioxidant Activity**

- **Mechanism**: Scavenges free radicals, enhances antioxidant enzymes like superoxide dismutase (SOD) and catalase.
- **Key Compounds**: Flavonoids (e.g., liquiritin, glabridin).
- **Effect**: Protects cells from oxidative damage and supports tissue repair.

4. **Antiviral Activity**

- **Mechanism**: Inhibits viral replication and boosts immune response.
- **Key Compound**: Glycyrrhizin.
- **Effect**: Active against viruses such as hepatitis B and C, herpes simplex, and SARS-CoV.
- **Research**: Glycyrrhizin has shown inhibitory effects on SARS-Co. in vitro.

5. **Antibacterial and Antifungal Activity**

- **Mechanism**: Disrupts microbial cell walls and inhibits biofilm formation.
- **Effect**: Effective against Helicobacter pylori, Staphylococcus aureus, and Candida species.

AIM: - TO IN VITRO ASSESSMENT AND EVALUTION LIQUORICE ROOT EXTRACT FOR ANATACID ACTIVITY .

OBJECTIVE:-

1. To prepare an extract of liquorice (Glycyrrhiza glabra) root using appropriate extraction methods.
2. To perform phytochemical screening of the liquorice root extract to identify the presence of bioactive constituents potentially responsible for antacid activity.
3. To evaluate the in vitro antacid activity of the liquorice root extract by assessing its acid-neutralizing capacity.

4. To compare the antacid activity of the liquorice root extract with that of standard antacid formulations.
5. To determine the buffering capacity and duration of acid-neutralizing effect of the extract.
6. To assess the potential of liquorice root extract as a natural alternative to synthetic antacid medications for the management of gastric acidity.

MATERIALS AND METHOD

PLANT PROFILE: LIQUORICE ROOT (GLYCYRRHIZA GLABRA)

KINGDOM:-PLANTAE

Phylum:-Tracheophytes

Class:-Dicotyledons

Order:-Fabales

Family:-Legumes

Genus:-Glycyrrhiza

Species:-Glycyrrhiza glabra

■ Plant Authentication:

-The Root Of liquorice Collected During Rainy Season from a Rural Area of Maharashtra, India and Was Evaluated Having Reference No-RJS/PH/2024-25/4855 Dated 12-04-2025 And Samples Were Deposited in the Herbarium of the S.S.G.M. Science, Gautam Arts and Sanjivani Commerce College at Kopargaon.

Botanical Background:-

Liquorice is a perennial herb native to southern Europe and parts of Asia, especially India, Iran, and China. The root of the plant is the part most commonly used in traditional medicine. It belongs to the Fabaceae (legume) family and is characterized by a sweet taste due to its active compound glycyrrhizin, which is up to 50 times sweeter than sucrose.

Phytochemical Constituents:-

Liquorice root contains a rich array of bioactive compounds, including:

- Triterpenoid saponins: Especially glycyrrhizin (or glycyrrhizic acid), which has anti-inflammatory and antiviral properties.
- Flavonoids: Such as liquiritin, liquiritigenin, glabridin, and isoliquiritigenin—these contribute to antioxidant and anti-inflammatory effects.
- Coumarins: Like herniarin and umbelliferone, which add to its therapeutic potential.
- Polysaccharides, sterols, and essential oils. These constituents CT synergistically to produce various pharmacological effects.

3. Medicinal Uses:-

Liquorice has been used for a wide range of health conditions, including:

- Gastrointestinal Disorders: Ulcers, gastritis, acid reflux, and indigestion.
- Respiratory Issues: Cough, bronchitis, and sore throat.
- Inflammatory Conditions: Such as arthritis and eczema.
- Hormonal and Endocrine Support: Adaptogenic effects on adrenal fatigue.
- Antiviral and Antibacterial: Inhibits replication of viruses like hepatitis C, and bacteria such as H. pylor

Plant extraction method:

Preparation of Herbal Extract of liquorice (Glycyrrhiza glabra) –

1.One hundred grams of liquorice powder was mixed with 500 ml of 100% ethanol in a conical flask.

2.The mixture was stirred thoroughly with a glass rod. The conical flask was kept with intermittent shaking for 72 h.

3.The mixture was filtered using muslin cloth and through Whatman No. 1 filters paper.

4.The filtrate was concentrated using an IKA rotary evaporator at 40°C, and the resultant residue was kept in a refrigerator till further use

EXPERIMENTAL WORK

TEST	OBSERVATION	INFERENCE
TEST FOR TERPENOIDS : Sample + Chloroform + con. Sulfuric acid	Reddish-brown coloration	Presence of Terpenoid

1) PHYSICOCHEMICAL PARAMETERS OF GLYCYRRHIZA GLABRA :-

TABLE NO. 5.1 PHYSICOCHEMICAL PARAMETER OF GLYCYRRHIZA GLABRA

TEST	OBSERVATION	INFERENCE
Test for Flavonoids		
Lead acetate test: Sample + few drop of 10 % lead acetate sol.	Yellowish ppt observed	Presence of Flavonoid
Shinoda test: Sample +piece of magnesium metal+ 5-10 drops of con.HCL	Pink colour observed	Presence of Flavonoid
Alkaline reagent test: Sample +drops of dil.NaOH	Deep yellow colour observed	Presence of Flavonoid
Test for Tannins		
Ferric chloride test: Sample +few drops of 5% ferric chloride sol.	Dark blue ppt observed	Presence of Tannin
Test for saponins		
Foam test: Sample +distilled water+shake 30 sec. to60sec.	1cm foam formed	Presence of Saponin

TABLE NO:5.2 PHYSICOCHEMICAL PARAMETER OF GLYCYRRHIZA GLABRA

2)IN VIRTO STUDY:

Assessment of antacid activity by rossette rice method :

Step1: Preparation of Different Concentration Of Extracts

- Make the Hydro alcoholic extract different quantity.
- That is 800mg, 1000mg, 1200mg concentrations prepare.
- Then the antacid activity result will obtain by the in vitro method that will compare to the standard drug.
- Which have the concentrations 200mg, 400mg, 600mg. Ex: sodium bicarbonate.

Step 2: Preparation of 0.1N HCL:

Take 2.1 ml concentrated HCL and dilute 250 ml with distilled water in volumetric flask (250ml) to obtain 0.1N HCL.

Step 3: In-vitro assessment of antacid activity by rossette rise method.

1. Preparation of acidic medium The PH Profile during Neutralization reaction was followed byt is an acid neutralizing dynamic test.
2. It is an in vitro method reflecting the efficacy of dose of antacid.
3. The Rosette-Rice test attempted to stimulate the stomach, and to record the pH profile during acid neutralization.
4. The pH profile during the neutralization reaction was followed by adding 70 ml of 0.1 N HCl and 30 ml of distilled water, to a 500 ml reaction beaker.
5. When the temperature was maintained at 37°C, an equivalent weight of tablet sample was added introduced into the reaction beaker under continuous magnetic stirring.
6. Then, 0.1N hydrochloric acid was continuously added at a rate of 2 ml / min, from a burette.
7. A pH meter was attached to the reacting vessel, to record the pH during the neutralization reaction.
8. The time taken to reach pH 3.0 and Rosette-Rice time (RRT) i.e. the time during which the pH maintained between pH 3.0 and 5.0,was noted and also the pH changes were recorded as a function.

OBSERVATION AND RESULT:-

1) Invitro antacid activity of sodium bicarbonate

DOSE	INITIAL PH	FINAL PH	TIME
200mg	1.9	3.03	7min 50sec
400mg	6.29	3.04	8min 15sec
600mg	7.25	3.04	10min 12sec

TEST	OBSERVATION	INFERENCE
	Test for Flavonoids	
Lead acetate test	Yellowish ppt observed	Flavonoid's present
Shinoda test	Pink colour observed	Flavonoid's present
Alkaline reagent test	Deep yellow colour observed	Flavonoid's present
	Test for Tannins	
Ferric chloride test	Dark blue ppt observed	Tannins present
	Test for saponins	
Foam test:	1cm foam formed	Saponin present

TABLE NO: 6.5 PHYSICOCHEMICAL PARAMETER OF GLYCYRRHIZA GLABRA

SUMMARY AND CONCLUSION

We expected that this investigation would provide encouragement for further exploration into new drugs for the prevention and treatment of acidity. In The present investigations antacid activity showed by the extract of Liquorice root our invitro testing showed promising results and significant reductions in ph. So we can assume that further testing's may focus on the other aspect of the drug.

Further pharmacological and clinical studies are required to understand the mechanism and the actual efficacy of the drug. We expected that this investigation would provide encouragement for further exploration into new drugs for the prevention and treatment of acidity or hyper acidity.

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