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Research Article

Formulation and Evaluation of Poly Herbal Anti-GERD Powder

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Disorders of the gastrointestinal tract (GIT) are common health problems that affect normal digestive functions and produce symptoms such as abdominal pain, indigestion, bloating, diarrhea, constipation, vomiting, and reflux. Among these conditions, gastroesophageal reflux disease (GERD) is widely reported and occurs when stomach contents flow back into the esophagus, leading to heartburn, regurgitation, and irritation of the esophageal lining. Although conventional medicines like proton pump inhibitors and H2 receptor antagonists are commonly prescribed, their long-term use may cause unwanted effects and reduced patient compliance. In recent years, there has been renewed interest in traditional systems of medicine and plant-based therapies for digestive disorders. Herbal remedies have been used for centuries in many parts of the world and continue to play an important role in primary healthcare, especially in developing countries. Medicinal plants contain natural bioactive compounds with antioxidant, anti-inflammatory, mucosal protective, and mild acid-regulating properties, making them promising alternatives or supportive options in GERD management. This study presen ts the formulation and evaluation of a polyherbal powder designed to help prevent and manage GERD symptoms. Selected medicinal plant ingredients were chosen based on their traditional use and reported gastroprotective potential. The prepared formulation was assessed for physicochemical properties, stability, safety, and patient acceptability. Overall, integrating scientifically evaluated herbal formulations into GERD management may provide a safer and more holistic approach. However, further standardization, dosage optimization, and well-designed clinical studies are necessary to ensure consistent efficacy and quality.

Keywords: Gastroesopageal, Reflux disease, GERD, Natural products, Anti-inflammatory.

INTRODUCTION

Digestive disorders are among the most common health concerns worldwide and often disturb daily life and general well-being. Many individuals experience symptoms such as bloating, constipation, diarrhea, indigestion, and abdominal discomfort at some point in their lives. In the United States, millions of people report digestive complaints every year, and similar trends are observed in developing countries, including India, where lifestyle-related diseases are rising steadily. Poor dietary habits, obesity, stress, smoking, alcohol intake, and lack of physical activity play a major role in increasing gastrointestinal problems. Conditions like functional dyspepsia, irritable bowel disorders, and inflammatory bowel diseases further add to the burden of digestive illnesses. Among these disorders, Gastroesophageal Reflux Disease (GERD) has emerged as a major chronic condition. GERD occurs when stomach contents move backward into the esophagus, leading to troublesome symptoms such as heartburn and acid regurgitation. In severe cases, continuous exposure of the esophagus to acid may result in inflammation, ulcers, narrowing of the

esophagus, or precancerous changes. The condition affects people of all age groups, although its frequency varies across regions. Western countries report a higher percentage of affected individuals compared to many Asian regions. Factors such as high body mass index, advancing age, smoking, alcohol use, and medicines that reduce lower esophageal sphincter tone increase the risk. GERD may also produce symptoms beyond the esophagus, including chronic cough, throat irritation, asthma-like complaints, and dental problems, highlighting its broader health impact. Conventional drug therapy, including acid-suppressing agents, remains the standard approach for GERD management. However, long-term dependence on such medications has raised concerns about safety and cost. This has encouraged growing interest in plant-based remedies that have been traditionally used for digestive care. Herbal medicines rich in natural compounds such as flavonoids, terpenes, and phenolic substances show protective effects on the stomach and esophageal lining. These compounds may help by reducing excessive acid secretion, strengthening mucosal defense, and neutralizing harmful free radicals. Medicinal plants like ginger, licorice, aloe vera, and cumin have a long history of use in supporting digestion and relieving gastric discomfort. Their natural bioactive components are believed to possess anti-inflammatory, soothing, and antioxidant properties, making them promising options for GERD prevention and supportive management. Considering the increasing global burden of digestive disorders and the need for safer long-term strategies, exploring scientifically validated herbal approaches may provide a practical and patient-friendly solution for improving gastrointestinal health. [1,2].

Table 1: Different types of problem

Sl. No	Types of problems
1.	**Esophagitis:** Esophagitis is a condition in which the inner lining of the esophagus becomes swollen and irritated. The esophagus is a food pipe that transports food from the throat to the stomach. When stomach acid, infection, medicines, or allergies damage this lining, inflammation occurs and it is called esophagitis. [3]
2.	**Esophagel Sticture:** Esophageal stricture is a condition in which the esophagus becomes abnormally narrow. The esophagus is a food pipe that transports food from the throat to the stomach. When the inner lining of this tube is repeatedly damaged, scar tissue may develop. This scar tissue tightens the passage and reduces its normal width, making it difficult for food and liquids to move smoothly. [4]
3.	**Barrett's Esophagus:** Barrett's esophagus is a medical condition in which the normal inner lining of the esophagus changes because of long-lasting acid reflux. The esophagus is a food pipe that transports food from the throat to the stomach. Continuous exposure to stomach acid can injure the tissue of this tube. Over time, the normal cells are replaced by different cells that are more resistant to acid. [5]
4.	**Weak Lower Esophageal Sphincter (LES):** Weak Lower Esophageal Sphincter (LES) is a condition where the muscular valve between the esophagus and the stomach does not close properly. Normally, this circular muscle opens to allow food to enter the stomach and then closes tightly to stop stomach acid from moving upward. When the sphincter becomes weak or relaxes at the wrong time, acidic stomach contents can flow back into the esophagus. This backward movement of acid is a major reason for acid reflux and GERD.[6]

Powder: A powder is defined as a solid dosage form composed of finely divided drugs and/or excipients, intended for internal or external use. It is one of the oldest and simplest pharmaceutical preparations and serves as a fundamental dosage form in drug delivery systems. Powders may contain a single medicinal substance or a mixture of active pharmaceutical ingredients and suitable additives such as diluents, preservatives, or flavoring agents. Due to their large surface area, powders generally exhibit faster dissolution and enhanced bioavailability compared to other solid dosage forms like tablets and capsules. [7]

MATERIAL AND METHODOLOGY:

1. Collection of Herbal Components:

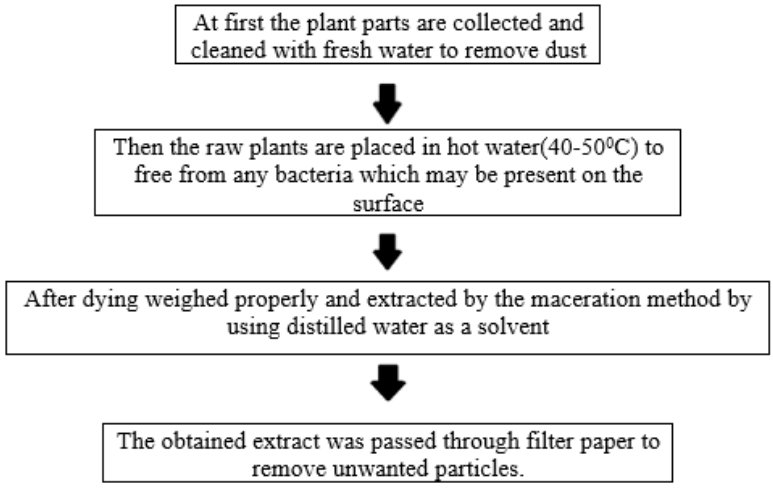
Ginger, Turmeric, Bael fruit were collected from the local place, and the other components like Fennel, Fenugreek, Liquorice, Cumin, Amla were collected from local market.

Table 2: - Herbal and Chemical Component Details

Sl. No	Ingredients	Chemical Constituents	Function	Image
1.	Ginger *(Zingiber officinale)* Family: Zingiberaceae Plant part: Root	Sesquiterpenoid-Zingiberene ($C_{15}H_{24}$)	Anti-inflammatory, Gastrointestinal Health, Antiemetic, Respiratory Support, Antimicrobial, Antioxidant [8].	
2.	Turmeric *(Curcuma longa)* Family: Ginger Plant part: Root and rhizomes	Polyphenol-Curcumin ($C_{21}H_{20}O_6$)	Anti-inflammatory agent, Antioxidant properties. [9]	
3.	Fennel *(Foeniculum vulgare)* *Family: Apiaceae* *Plant part: Seed*	Volatile oil- Trans anethole ($C_{10}H_{12}O$), Monoterpenoid-fenchone($C_{10}H_{16}O$)	Antibacterial and anti-inflammatory properties, antioxidant. [10]	
4.	Fenugreek (*Trigonella foenum-graecum*) Family: Fabaceae Plant part: Seed	Polysaccharide-Galactomannan ($C_{18}H_{32}O_{16}$)	as sensitive biomarker for the early diagnosis of invasive aspergillosis (IA), a severe fungal infection in immune compromission patients. [11]	
5.	Cumin *(Cuminum cyminum)* Family: Apiaceae Plant part: dried ripe seeds	Aromatic aldehyde-Cuminadehyde ($C_{10}H_{12}O$), Monoterpenoid Phenol-Thymol($C_{10}H_{14}O$)	Antioxidant effect, Antiseptic, Digestive aid, relives gas. [12]	
6.	Liquorice *(Glycyrrhiza glabra)* Family: Leguomes Plant part: Root and rhizomes	Flavonoids - glabridin ($C_{20}H_{20}O_4$),	Anti-inflammatory, antioxidant & mucoprotective properties. [13]	

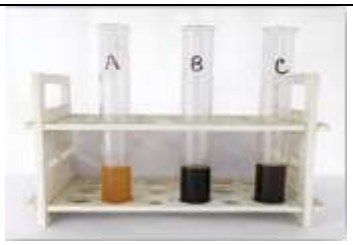
7.	Amla *(Phyllanthus emblica)* Family: Phyllanthaceae	Tannins – Emblicanin A ($C_{34}H_{22}O_{22}$), Emblicanin B ($C_{34}H_{24}O_{22}$), Vitamin-C	Gastroprotective, antioxidant, anti-inflammatory effect that help reduce heart burn and gastric mucosal injury. [14]	
8.	Bael Fruit *(Aegle marmelos)* Family: Rutaceae	Flavonoids- Rutin ($C_{27}H_{30}O_{16}$), Coumarin - marmelosin ($C_{16}H_{14}O_4$)	Diarrhoea, Constipation, Anti-inflammatory, acidity, heart burn, balancing stomachic acid, Anti- Diabetic. [15]	

2. Extraction of Different Herbal Drugs or Components:



3. Screening of those extracted components:

Sl. No	Ingredients	Reactions	Observation	Image
1.	Ginger	Prepare an aqueous extract of ginger. Add minimal volume of the ferric chloride mixture to the extract.	Violet colour appears, indicating the presence of phenolic compounds like ginger. A= Plant extract B= reagent C= Observed result	

2.	Turmeric	1 or 2 ml of extract was added with wagner's reagent (dissolving 2 gm of iodine and 6 gm of potassium iodide in 100 ml of distilled water).	Reddish brown precipitate shows the presence of alkaloids. A= Plant extract B= reagent C= Observed result	
3.	Fennel	Prepare on aqueous extract of fennel by dissolving fennel seed. Add a minimal volume of ferric chloride mixture to the extract.	Greenish colour appears, indicating the presence of phenolic compound. A= Seed extract B= reagent C= Observed result	
4.	Fenugreek	Prepare an aqueous extract of fenugreek seeds. Add a minimal volume of Wagner's regent.	Reddish-brown precipitate forms, indicating the presence of alkaloids such as fenugreek. A= Seed extract B= reagent C= Observed result	
5.	Cumin	Prepare an aqueous extract of cumin seeds. Add a minimal volume of ferric chloride mixture.	Greenish colour appears, indicating the presence of cumin. A= Seed extract B=reagent C=Observer result	
6.	Liquorice	80% H_2SO_4 treated with powder of the drug.	Orange yellow is observed for transformation of flavone glycoside liquiritin to chalcone glycoside isoliquiritin. A= Plant extract B= reagent C= Observed result	
7.	Amla	Prepare an aqueous extract of Indian gooseberry by dissolving powder in water. Add a few drops of ferric chloride solution.	Blue -black colour that indicating the presence of tannins and phenolic compound. A= Powder extract B= reagent C= Observed result	
8.	Bael Fruit	Prepare an aqueous extract of bael fruit pule by dissolving powder. Introduce a few drop of ferric chloride solution.	Greenish or Bluish colour appears, indicating the presence of tannins and phenolic compound. A= powder extract B= reagent C= Observed result	

4. Formulation Study:

This herbal formulation is designed to help manage GERD using natural ingredients. The base consists of bael fruit powder, providing digestive support and binding properties. Active ingredients include ginger, turmeric, fennel, fenugreek, cumin, liquorice, and Amla. All ingredients are dried, powdered, sieved, and mixed uniformly. The combination works by reducing gastric irritation, improving digestion, and protecting the mucosal lining. The formulation is intended for oral use with water, offering a simple, safe, and plant-based approach for GERD prevention.

Table 3: Formulation table for herbal powder

Sl. No	Name of ingredients	Each 10 gm. Contains
1.	Ginger extract	0.6%
2.	Turmeric extract	0.2%
3.	Fennel extract	0.6%
4.	Fenugreek extract	1.8%
5.	cumin extract	0.6%
6.	Liquorice extract	0.6%
7.	Amla powder	1.6%
8.	Beal Fruit Powder	4.0%

Evolution:

Organoleptic Properties:

Colour, odour, and taste were observed. The powder showed uniform Pale-Yellow colour with a characteristic herbal smell and slightly bitter taste.

PARTICAL SIZE & UNIFORMITY:

Powder passed through sieve ensuring uniform particle size for better mixing and absorption.

Phytochemical Screening:

Presence of tannins, flavonoids, saponins, and phenolic compounds detected.

pH Determination:

Slightly acidic to neutral pH, suitable for stomach compatibility.

General Powder Properties:

The particle size was measured using the microscope approach. and the tapping method was used to compute the dried powder's bulk density, tapped density and angle of repose in order to evaluate the flow property.

Angle Of Repose:

It is defined as the maximum angle possible in between the surface of pile of powder to the horizontal flow. It required amount of dried powder is placed in a cylindrical tube open at both ends is placed on a horizontal surface. Then the funnel should be raised to form a heap. The height and radius of the heap is noted and recorded. For the above method, the angle of repose (θ) Can be calculated by using the formula.

$\theta = \tan^{-1}(h / r)$

Where, θ – Angle of repose, h – Height of the heap, r – Radius of the base.

Bulk Density:

Bulk density is the ratio of the mass of the mass of a powder to the total volume it occupies prior to compaction, including the interparticulate void spaces.

Tapped Density:

Tapped density represents the bulk density of a powder measured after controlled mechanical tapping, reflecting the extent of particle packing and consolidation under external vibrational force.

Tapped density=mass of sample/tapped of sample

RESULTS AND DISCUSSION:

appearance, colour, odour, taste, moisture content, pH, Angle of repose, Bulk density, Tap density was observed as shown in Table 4.

Table 4: Organoleptic properties of herbal formulation

Sl No.	Parameter	Observation
1.	Appearance	Fine powder
2.	Colour	Pale Yellow
3.	Odour	Characteristic
4.	Taste	Sweet
6.	pH	7.1
7.	Angle of repose	38 Degree
8.	Bulk density	0.5 g/ml
9.	Tapped density	0.66 g/ml

CONCLUSION:

The present study successfully formulated and evaluated a herbal powder using selected medicinal plant extracts with proven GERD benefits. The formulation exhibited satisfactory organoleptic and physicochemical properties, appropriate Stomach-compatible pH, and absence of microbial contamination during the one-month stability study. The synergistic action of bioactive constituents such as flavonoids, tannins, volatile oil contributes to its Antibacterial, anti-inflammatory, antioxidant. Based on the evaluation results, the developed formulation can be considered safe, stable, and effective for oral application. However, extended stability studies and controlled clinical investigations are recommended to further validate its therapeutic efficacy and commercial applicability. The natural herbs works properly and it is shown that the natural ingredients used in this herbal GERD powder have individual and specific therapeutic and pharmacological effect on the human stomach.

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CONFLICT OF INTEREST: None.

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