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Review Article

A Review: On Formulation and Evaluation of Digestive Syrup

Pavan Bisen, Sanika Ladhaikar, Chandrashekhar Badwaik, Updesh Lade, Nitin Kapgate

Chhatrapati Shivaji Campus Chichgad Road, Deori, Dist. Gondia - 441 901 Deori, Gondia-441901 (M.S.).

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ABSTRACT

A novel herbal syrup was developed using natural extracts, including Terminalia Chebula, licorice, fennel, and other medicinal plants, to address common digestive issues such as constipation, bloating, and acid reflux. The syrup was prepared through ethanol extraction and evaluated based on physicochemical parameters like pH, viscosity, specific gravity, and total phenolic content, following the standards of the British Pharmacopoeia. Stability and quality were ensured through sedimentation and macroscopic assessments. The ingredients demonstrated synergistic effects, offering digestive support, anti-inflammatory, and antioxidant properties. The formulation is safe, effective, and easy to administer, providing a natural alternative to synthetic medications with minimal side effects. This study emphasizes the potential of herbal formulations in promoting digestive health and enhancing patient compliance.

INTRODUCTION

Digestion: - Digestion is the process by which food is broken down into smaller components that the body can absorb and use for energy and cell building. This process involves mechanical digestion, which occurs in the mouth, and chemical digestion, which happens in the gastrointestinal tract through digestive enzymes.

Digestive Track: - The digestive system consists of esophagus, stomach, intestines, liver, pancreas, and gallbladder. Digestive disorders, affecting around 20% of the global population, can cause

symptoms like bloating, constipation, heartburn, nausea, and abdominal pain, significantly impacting quality of life.

Terminalia Chebula: - Also known as Haritaki, is a traditional Ayurvedic herb commonly used to support digestion and treat digestive issues like constipation. It is often combined with other herbs in formulations aimed at enhancing gut health. Licorice root and fennel are additional herbs with digestive benefits, used in various cultures for their ability to soothe digestive discomfort and support overall health. This study explores the

***Corresponding Author:** Pavan Bisen

Address: Chhatrapati Shivaji College of Pharmacy, Deori, Dist-Gondia, 441901.

Email ✉: pbpavan25@gmail.com

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development of a novel digestive syrup that combines these herbs to promote digestive well-being and alleviate common digestive problems.

🚩 Disease Of Digestive System: -

Constipation: -

Which is a functional problem, makes it hard for you to have a bowel movement (or pass stools), the stools are infrequent (less than three times a week), or incomplete. Constipation is often related to inadequate "roughage" or fiber in your diet, or a disruption of your regular routine or diet. Constipation causes you to strain during a bowel movement. It may cause small, hard stools and sometimes anal problems such as fissures or hemorrhoids. Constipation is rarely the sign that you have a more serious medical condition.

Colon Polyps and Cancer: -

Each year, 130,000 Americans are diagnosed with colorectal cancer, the second most common form of cancer in the United States. Fortunately, with advances in early detection and treatment, colorectal cancer is one of the most curable forms of the disease. By using a variety of screening tests, it is possible to prevent, detect and treat the disease long before symptoms appear.^[1, 2, 3]

Gastroenteritis: -

Commonly called the stomach flu, is not influenza but an infection of your gastrointestinal tract caused by viruses, bacteria, parasites, or chemicals. Gastroenteritis caused by a virus is called viral_gastroenteritis. National Institute of Diabetes and Digestive and Kidney Diseases. Definition & facts for viral gastroenteritis ("stomach flu"). Many viruses can be spread from person to person and cause infections. Some common viruses that can cause gastroenteritis

include norovirus, rotavirus, adenovirus, and astrovirus. Symptoms of gastroenteritis usually include:

- Diarrhea
- Abdominal pain or cramping

- Nausea
- Vomiting
- Fever
- Fatigue

Viral gastroenteritis tends to be acute, usually lasting less than a week. Most people get better on their own without medical treatment. However, more serious cases can lead to dehydration and may require medical treatment.^[4]

Constipation And Diarrhea: -

These are common GI issues. Both are often symptoms of other digestive system problems and can greatly impact quality of life. Constipation is a condition in which bowel movements are reduced, and you have fewer than three a week. Other symptoms include hard, dry, or lumpy stools that are difficult or painful to pass or a feeling that all the stool has passed. Causes of constipation include certain medical conditions (especially those that affect the digestive system), changes in physical activity or diet, pregnancy, side effects of medications, and more.^[5]

Irritable Bowel Syndrome: -

It is a chronic condition that affects the large intestine (colon). In the United States, it's estimated that about 12% of people have IBS.^[6]

IBS comprises a group of symptoms that occur together, including:

- Abdominal pain and cramping
- Abdominal bloating
- Gas
- Diarrhea
- Constipation

The three subtypes of IBS, depending on the dominant symptom, are:

- IBS with constipation (IBS-C)
- IBS with diarrhea (IBS-D)
- IBS with mixed bowel habits (IBS-M)

With IBS, symptoms occur without any visible signs of physical damage or disease in the digestive tract. However, symptoms can still greatly impact quality of life.^[7]



Acid Reflux: -

It is a common term for gastroesophageal reflux (GER). GER is sometimes called heartburn, reflux, acid indigestion, and acid regurgitation. GER happens when the stomach contents come back up into your esophagus (food pipe). Many people experience GER now and then. It can occur without causing any symptoms, or, in some cases, it can cause indigestion or a mild burning sensation in the chest. Gastroesophageal reflux disease (GERD) is when GER symptoms become more chronic and severe. In the United States, about 20% of people have GERD.^[8]

Peptic Ulcers: -

A peptic ulcer, or stomach or duodenal ulcer, is a sore on the lining of your stomach or duodenum (the first part of the small intestine). It is sometimes called peptic ulcer disease. In the United States, it's estimated that 1% to 6% of people have peptic ulcers.^[9] Peptic ulcers can lead to bleeding in the digestive tract, a hole in the wall of the stomach or duodenum, ulcers in nearby organs, and blockage that stops food from moving into the duodenum. Two common causes of peptic ulcers include an infection with *Helicobacter pylori* (*H. pylori*) bacteria and high doses or chronic use of nonsteroidal anti-inflammatory drugs (NSAIDs), such as Advil or Motrin (ibuprofen) and Aleve (naproxen).^[10]

Symptoms of a peptic ulcer include:

- Abdominal pain or discomfort in the upper part of the abdomen
- Feeling full soon after starting a meal or overfull after eating a normal-sized meal
- Indigestion
- Nausea
- Vomiting
- Abdominal bloating
- Belching
- Passing black or tarry stool
- Vomiting blood.^[11]

Classification Of Terminula Chebula: -

Classification According To The Size Of The Fruit: -

- Survari harade - which are large, dense and heavy about 2 inches long, yellowish-brown: when cut it contains yellowish or darkish brown, pulp and stone.
- Rangari harade - these are smaller, less wrinkled and less furrowed than the above variety; in length about an inch; the epidermis is yellow; when cut it presents a yellow dried pulp and a stone. The pulp is less astringent than that of survari harade.
- Bala harade - are smaller than the above two varieties. Their color is deep brown or black; highly wrinkled, dark or brown epidermis. Their pulp is dark and homogenous; there is no stone.
- Java harade - these are the smallest of all. Other characters are similar to those of Bala harade.

Classification According to Shape: -

- Vijaya - having alabu shape used in all diseases, habitat in vindahya mountains.
- Rohini - Round in shape- used in vrana, habitat in zansi and other states of India.
- Pootana - Size is small, mesocarp is less, seed is bigger, externally used, habitate Sind.
- Amirtha - Mesocarp is more used for shodhanakarma habituate
- Abhya - Fruit having five ribbed used in eye diseases, habitate champaranya, Himalaya.
- Jeevantee - fruit is golden yellow, used in all diseases, habitate himalaya.
- Chetaki - Fruit having three ribs, used as purgative.
- Classification According To The Growth Of The Fruit: -
- Halileh - Zira. When the size is that of a cumin seed.
- Halileh - Javi, when the size is that of a barely corn.
- Halileh - Zangi when the size is of a raisin.



- Halileh - Chini when fruit is greenish yellow and somewhat hard.
- Halileh - Asfer when it is very nearly mature.
- Halileh - Kabul or fully matured fruit.^[12]

Chattopadhyay and Bhattacharyya, classified the *T. chebula* of three types - actually these are the different stages of maturity of fruits (a) small Myrobalan- the immature fruit; (b) yellow Myrobalan- after development of seed, the mature stage of the fruit; (c) large Myrobalan- the fully matured fruit.^[13]

Major Chemical Constituents in Terminalia Chebula: -

33% of the total phytoconstituents are hydrolysable tannins (which may vary from 20-50%) and are responsible for pharmacological activity. These tannins contain phenolic carboxylic acid like gallic acid, ellagic acid, chebulic acid and gallotannins such as 1,6 di-O-galloyl- β -D-glucose, 3,4,6 tri-O-galloyl- β -D-glucose, 2,3,4,6 tetra-O-galloyl- β -D-glucose, 1,2,3,4,6 penta-Ogalloyl- β -D-glucose. Ellagitannin such as punacalagin, casuarinin, corilagin and terchebulin and others

such as chebulanin, neochebulinic acid, chebulagic acid and chebulinic acid reported in literature.^[14, 15] The tannin content varies with the geological variation. Flavonol glycosides, triterpenoids, coumarin conjugated with gallic acid called chebulin, as well as phenolic compounds were also isolated.^[16] Various methods have been reported for extraction of phytoconstituents from *Terminalia chebula* for studying their pharmacological activities. total eight compounds viz. gallic acid, methyl gallate, ethyl gallate, chebulagic acid, tetra-O-galloyl- β -D-glucose, ellagic acid, chebulinic acid and penta-O galloyl- β -D-glucose from *Terminalia chebula* were isolated on reverse phase chromatography. There are seven varieties of *Terminalia chebula* all of which are more or less used in similar fashion but vary in specific usages and quality.^[17]

Types of Herbal Syrup: -

- 1.Flavored syrup
- 2.Medicated syrup
- 3.Artificial syrup

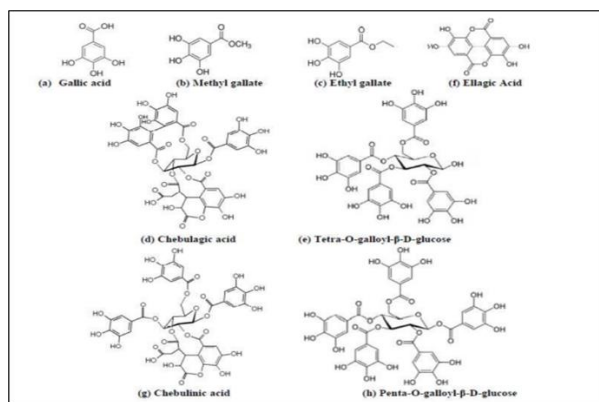


Fig. No. 01 (various acids present in Terminalia Chebula and their structures)

Advantages Of Herbal Syrup:

- No side effects.
- No Harmless.
- Easily available.
- Easy to adjust the dose for child's weight.
- No nursing is required, which main and the patient can take it with no help.
- The liquid dosage form is executed for products like cough medicines.
- Herbs Grow in common place.
- Antioxidant by retarding the oxidation as sugar is Hydrolyzed in to cellulose and dextrose.
- Good patient compliance especially pediatric patients as syrup are sweet in test.
- It is a preservative by retarding the growth of bacteria, fungi and mold as osmotic pressure.

✚ **Disadvantage Of Herbal Syrup: -**

- Sedimentation of solid occasionally gives foot from of product.
- Dose precision cannot be achieved unless suspension suspensions are packed in unit dosage forms.
- Same microbial contamination take place it preservation not added in accurate proportion.

Also, herbal medicine having another disadvantage is the risk of self-dosing of herbs which is very rare. Fluctuation in storage temperature may cause crystallization of sucrose from saturated syrup.^{[18, 19].}

✚ **Plant Profile: -**

1. Haritaki: -

Botanical Classification: -

- Biological source- It consists of dried root of plant Known Terminalia Chebula.
- Family- Combretaceae.
- Geographical source- Dhaka, Bangladesh.
- Synonym- Harad (Hindi), Hirda (Marathi), Ammai (Tamil), Harar (Punjabi).
- Division- Mangnoliophyta.
- Subclass- Epigynae.
- Order- Myrtales.
- Genus- Terminalia.^[20, 21]

Chemical Constituent: -

Elagic acid, chebulinic acid, chebulic acid, gallic acid, leteolin, corilagin.

Medicinal Uses: -

In Traditional Haritaki means "carries away" (all diseases). Is an important Ayurvedic medicine, which often promotes health through successive steps of purification and detoxification. It is known to have strong anti-mutagenic activity. Because of its very rich content of vitamin C. Haritaki is a safe and effective purgative mild laxative, stomachic, tonic, alterative, adaptogen, hepatoprotective, febrifuge, antispasmodic, astringent, expectorant, anti-asthmatic, antiviral, and hypoglycemic. It is useful in ophthalmia, hemorrhoids, dental caries,

bleeding gums, ulcerated oral cavity and in many other diseases, according to Ayurveda.^[22, 23]



Fig. No. 01 (Haritaki)

2. Fennel

Botanical Classification: -

- Biological source- It is obtained from seed of Foeniculum Vulgare.
- Kingdom- Plantae.
- Clade- Angiosperms.
- Geographical source- India, South Africa.
- Synonym- Saunf (Hindi), Madhurika (Sanskrit), Hinojo (Spanish).
- Order- Apiales.
- Family- Apiaceae (Carrot or Parsley family).
- Genus- Foeniculum.
- Species- F. vulgare.^[24, 25]

Chemical Constituent: -

Camphene, fenchone, anethole.^[26, 27]

Medicinal Uses: -

1. Carminative (relieves gas and bloating).
2. Antispasmodic (relaxes smooth muscles).
3. Stimulant.
4. Expectorant.
5. Flavoring agent in food and liquors.^[28, 29, 30]



Fig. No. 02 (FENNEL)

3. Liquorice

Botanical Classification: -

- Biological source- It is dried root of glycyrrhiza glabra.
- Kingdom- Plantae.

- Clade- Angiosperms.
- Geographical source- Europe, South Africa India.
- Synonym- Mulethi (hindi), yashtimadhu (sanskrit), glycyrrhizae (chinese).
- Order- Fabales.
- Family- Fabaceae (Legume family).
- Genus- Glycyrrhiza.
- Species- *G. glabra*.^[31, 32]

Chemical Constituent: -

Glycyrrhizin (50-60%): A triterpenoid saponin, responsible for sweetness and pharmacological effects.

Flavonoids (10-20%): Liquiritigenin, isoliquiritigenin, and others, contributing to antioxidant and anti-inflammatory properties.

Isoflavonoids (5-10%): Glycitein, licoricidin, and others, showing estrogenic and antioxidant activities.

Phenolic acids (2-5%): Caffeic, ferulic, and sinapic acids. Volatile oils (1-3%): Anethole, estragole, and beta-caryophyllene.

Polysaccharides (10-20%): Starch, cellulose, and hemicellulose. Terpenoids (2-5%): Beta-sitosterol, stigmasterol.

Amino acids (2-5%): Asparagine, glutamine, and others.

Minerals (1-3%): Potassium, calcium, magnesium, and iron, Glycyrrhetic acid (GA), 18 β -Glycyrrhetic acid (18 β -GA), Liquiritigenin, Isoliquiritigenin, Glycitein.^[33]

Medicinal Uses: -

1. Digestive issues: Heartburn, indigestion, stomach ulcers.
2. Respiratory problems: Cough, bronchitis, asthma.
3. Skin conditions: Eczema, acne, dermatitis.
4. Menstrual issues: PMS, menopause symptoms.
5. Stress relief: Anxiety, depression.
6. Anti-inflammatory: Arthritis, joint pain.
7. Antiviral: Herpes, HIV.

8. Hepatoprotective: Liver protection.^[34, 35]



Fig. No. 03 (Licorice)

4. Black Pepper: -

Botanical Classification: -

- Biological source- It consists of dried unripe fruits of *Piper nigrum* linn.
- Kingdom- Plantae.
- Clade- Angiosperms (Flowering plants).
- Geographical source- India, Vietnam, Indonesia, and Brazil.
- Synonym- Kali Mirch (Hindi), Golmarich (Bangali), Milagu- Milagu.
- Order- Piperales.
- Family- Piperaceae.
- Genus- *Piper*.
- Species- *Piper nigrum*.^[36]

Chemical Constituent: -

Piperine (5-9%): Alkaloid responsible for pungency, bioavailability enhancement, and pharmacological activities. Piperamin: Alkaloid with analgesic, anti-inflammatory properties. Piperlongumin: Alkaloid with anti-inflammatory, antioxidant activities. Limonene: Terpene with antioxidant, anti-inflammatory properties. Beta-Caryophyllene: Sesquiterpene with anti-inflammatory, antimicrobial activities. Volatile Oils: Alpha-Pinene, Beta-Pinene, Sabinene, Terpinolene, Linalool. Flavonoids: Quercetin.^[37]

Medicinal Uses: -

1. Digestive issues(dyspepsia, diarrhea).
2. Respiratory problems(cough, cold).
3. Pain relief(analgesic).
4. Infections(antimicrobial).
5. Cancer prevention(anticancer).
6. Neurological disorders(neuroprotective).^[38, 39]



Fig. No. 04 (Black Pepper)

5. Asafoetida

Botanical Classification: -

- Biological source- It is an oleo gum resin obtained from the roots of *Ferula foetida* Regel, *F. rubricaulis* Boissier.
- Kingdom- Plantae.
- Family- Apiaceae.
- Genus- *Ferula*.
- Species- *Ferula asafetida*.
- Synonym- Hing, *Ferula*.
- Geographical source- These plants grow in Afganistan, Persia and Central Asia.^[40]

Chemical Constituents: -

The main constituents are volatile oil (10-17%), resin (40-65%) and gum (1.5- 10%) . Resin consists of resene (asaresene A) and volatile oil. It also contains 1.5 percent of free ferulic acid and 16 percent of unstable ester of ferulic acid with asaresinol. Volatile oil contains pinene and various disulphides (C₇H₁₄S₂, C₁₁H₂₀S₂, C₁₀H₁₆S₂). Ferulic acid yields umbellic acid, when it is treated with hydrochloric acid, loses water molecule and forms umbelliferone. Free umbelliferone is absent in *asafoetida*.^[41]

Medicinal Uses: -

1. Relieves digestive issues (bloating, gas).
2. Antioxidant and anti-inflammatory properties.
3. May help lower blood pressure and cholesterol.
4. Antimicrobial and antifungal properties.
5. Neuroprotective effects.^[42]



Fig No. 05 (Asafoetida)

6. Fenugreek: -

Botanical Classification: -

- Biological source- Seeds of the fenugreek (*Trigonella foenum-graecum*) plant.
- Kingdom- Plantae.
- Phylum- Magnoliophyta.
- Class- Magnoliopsida.
- Order- Apiales.
- Family- Apiaceae (Carrot or Parsley family).
- Synonym- Methi (Hindi), Greek Hay, Bird's Foot.
- Geographical source- Afghanistan, Iran, Pakistan, India.
- Genus- *Ferula*.
- Species- *Ferula asafetida*.^[43]

Chemical Constituent: -

Alkaloids (40-50%): Trigonelline, gentianine, and carpaine.

Saponins (10-15%): Fenugreek saponins A-B.

Flavonoids: Quercetin, kaempferol, and naringenin.

Fiber (20-30%): Galactomannans.^[44]

Medicinal Uses: -

1. Hypoglycemic (blood sugar control).
2. Hypolipidemic (cholesterol reduction).
3. Anti-inflammatory.
4. Antimicrobial.
5. Antioxidant.
6. Lactation stimulant.
7. Digestive issues (constipation, diarrhea).^[45, 46]



Fig. No. 06 (Fenugreek)

7. Peppermint Oil

Botanical Classification: -

- Biological source- Mentha oil is obtained by steam

distillation of flowering tops of *Mentha piperita* Linn.

- Kingdom- Plantae.
- Phylum- Magnoliophyta.
- Class- Magnoliopsida.
- Synonyms- Peppermint oil, Oleum mentha Piperita, Mint oil.
- Order- Lamiales.
- Family- Lamiaceae.
- Genus- Mentha.
- Species- *Mentha piperita*.^[47, 48]

Chemical Constituents: -

Menthol (35-45%): Cooling, analgesic, and anti-inflammatory.

Menthone (15-25%): Antimicrobial, anti-inflammatory, and antioxidant.

Limonene (5-10%): Antimicrobial, antioxidant, and anti-inflammatory.

Eucalyptol (2-5%): Decongestant, anti-inflammatory, and antioxidant.

Beta-Caryophyllene (1-3%): Anti-inflammatory, antimicrobial, and antioxidant.

Alpha-Pinene (0.5-2%), Beta-Pinene (0.5-2%), Gamma-Terpinene (0.5-2%), Terpinolene (0.5-2%), Linalool (0.5-1%), Bergamotene (0.5-1%), Piperitone (0.5-1%).^[49, 50]

Medicinal Uses: -

➤ Digestive System: -

1. Relieves nausea and vomiting.
2. Eases indigestion and bloating.

3. Reduce irritable bowel syndrome (IBS) symptoms.

4. Soothes stomach ulcers.

5. Supports gut health.

➤ Respiratory System: -

1. Relieves congestion and coughs.

2. Eases bronchitis and asthma symptoms.

3. Helps clear mucus and phlegm.

4. Reduces sinus pressure and headaches.

5. Supports lung health.^[51, 52]



Fig. No. 07 (Peppermint Oil)

8. Kalonji

Botanical Classification: -

- Biological source- seeds obtained from *Nigella sativa* plant.

• Kingdom- Plantae.

• Family- Ranunculaceae

• Synonym- Black Seed, Black Cumin, Nigella, Fennel Flower,

Love-in-a mist, Roman Coriander.

• Geographical source- Middle East (Egypt, Turkey, Iran), South Asia (India, Pakistan, Bangladesh).

• Genus- *Nigella*.

• Species- *N. sativa*.^[53]

Chemical Constituents: -

Thymoquinone (30-40%): Antioxidant, anti-inflammatory, antimicrobial.

Oleic acid (20-30%): Anti-inflammatory, antioxidant.

Linoleic acid (10-20%): Antioxidant, anti-inflammatory.

Palmitic acid (5-10%): Antimicrobial, antioxidant.

Vitamin E, Fatty acids, and Amino acids. Thymoquinone, Oleic acid, Linoleic acid, Palmitic acid, Vitamin E, Fatty acids, Amino acids.^[54]

Medicinal Uses: -

1. Digestive issues: Relieves bloating, gas, diarrhea.
2. Respiratory problems: Asthma, bronchitis, coughs.
3. Skin conditions: Acne, eczema, psoriasis.
4. Immune system: Boosts immunity, fights infections.
5. Cancer prevention: Antioxidant, anti-tumor properties.
6. Diabetes management: Regulates blood sugar.
7. Cardiovascular health: Lowers cholesterol, blood pressure.^[55, 56]
3. Skin and hair: Promotes healthy skin, hair growth.
4. Eye care: Reduces cataract risk, improves vision.
5. Cardiovascular health: Lowers cholesterol, blood pressure.
6. Anti-inflammatory: Reduces inflammation, pain.
7. Antioxidant: Protects against cell damage.^[60, 61]



Fig. No. 08 (Kalonji)

9. Amla: -

Botanical Classification: -

- Biological source- It is obtained from plant phyllanthaceae emblica.
- Kingdom- Plantae.
- Family- Phyllanthaceae.
- Geographical Sources- India, Sri Lanka, China, Southeast Asia, Africa.
- Synonym- Indian Gooseberry, Amla, Amalaki, Nellikai, Aonla.
- Genus- Emblica.
- Species- *E. officinalis*.^[57, 58]

Chemical Constituents: -

Vitamin C (1800-3000 mg/100g), Tannins (30-40%), Flavonoids, Phenolic acids, Emblicanin, ascorbic acid (vitamin C), carotene. It contains different polyphenols such as ellagic acid, gallic acid, apigenin, quercetin, luteolin, and corilagin.^[59]

Medicinal Uses: -

1. Digestive issues: Enhances digestion, relieves constipation.
2. Immune system: Boosts immunity, fights infections.



Fig. No. 9 (Amla)

10. Aloe Vera: -

Botanical Classification: -

- Biological source- It comes from fresh latex of aloe barbadensis miller.
- Kingdom- Plantae.
- Clade- Angiosperms.
- Order- Asparagales.
- Family- Asphodelaceae.
- Geographical Sources- Africa, India, China, USA, Mexico.
- Synonym- Ghrithkumari (Hindi), Kumari(Sanskrit), Chinigundi(Telugu), Sotthu, Kathalai (Tamil).
- Genus- Aloe.
- Species- *Aloe barbadensis*.^[62]

Chemical Constituents: -

Aloin (Anthraquinone): 20-30%, Aloe-emodin (Anthraquinone): 5-10% Vitamins: Vitamin A (Beta-carotene), Vitamin C (Ascorbic acid), Vitamin E (Tocopherol), Vitamin B12. Minerals: Calcium, magnesium, potassium, sodium, zinc. Amino acids: Alanine, Glutamic acid, Aspartic acid, Arginin. Polysaccharides: Acemannan,

Aloeride. Flavonoids: Kaempferol, Quercetin, Isorhapontigenin. Phenolic acids: Cinnamic acid, Ferulic acid, Sinapic acid. [63]

Medicinal Uses: -

1. Skin conditions: Soothes burns, wounds, eczema, and acne.
2. Digestive issues: Relieves constipation, IBS symptoms.
3. Oral health: Reduces gum inflammation, mouth sores.
4. Hair care: Promotes hair growth, reduces dandruff.
5. Anti-inflammatory: Reduces pain, swelling.
6. Antioxidant: Protects against cell damage. [64, 65]



Fig. No. 10 (Aloe Vera)

➤ MATERIALS AND METHOD: -

Herbal syrup is prepared by the method of decoction. The extract was prepared with an ethanol extract to obtain ethanol-specific active ingredients by the Soxhlet extraction method.

Collection Of Plant and Preparation Of Crude Extract: -

The plant was collected from the tropical regions and was identified by a taxonomist. The plant material was made free from soil and other adulterants and vegetative debris. The dried plant material was grinded to coarse powder with the help of a special herbal grinder. The powdered plant material (1kg) was subjected to maceration in 70% aqueous-methanol in amber colored bottle at room temperature for 7 days with occasional vigorous shaking at room temperature and keeping the extract in the dark room. The filtrate was obtained by passing the mixture through a muslin cloth and then through a Whatman qualitative

grade 1 filter paper. The filtrate was evaporated on a rotary evaporator attached to a vacuum pump at 37°C under reduced pressure to thick paste like consistency. And then the extract obtained was stored at 4°C in air tight jars.

Preparation Of Herbal Syrup: -

The simple syrup (66.67% w/v) was prepared as per British pharmacopoeia. 200 mg of extract of herbs. Honey was dissolved in simple syrup I.P. and the volume was made up to 100 ml and finally preservatives was added. Evaluation tests are carried out as follows

➤ Evaluation Of Formulated Syrup: -

Physicochemical parameters like Specific gravity, Density, pH, Refractive index, Alcohol content and Acid value were analyzed as per the standard procedure mentioned in British Pharmacopoeia.

Evaluation Parameter: -

Macroscopic Characteristics: -

Color, odor, taste, and appearance of the syrup were checked.

Colour: 5 ml of final syrup was taken in a watch glasses and placed under light, and colour is observed by naked eye.

Odour: 2 ml of final syrup was smelled individually and then the odour can be detected.

Taste: A pinch of final syrup was placed on the taste bud of tongue to identify the taste.

Moisture Content: -

2 gm of sample was weighed and taken in petridish. Heated in hot air oven at 100°C for 1 hr, allowed to cool and weighed the sample weight again.

Ethanol Soluble Extractive: -

5 gm of coarsely powdered and air dried drug was taken with 95% ethanol in closed flask for 24 hrs. Shaken for first 6 hrs and allowed to stand for next 18 hrs. filtered rapidly and evaporated 25 ml filtrate in petridish, dried at 105°C and weighed

Water Soluble Extractive : -

5 gm of coarsely powdered and air dried drug was taken with chloroform water in closed flask for 24

hrs. Shaken for first 6 hrs and allowed to stand for next 18 hrs. filtered rapidly and evaporated 25 ml filtrate in petridish, dried at 105°C and weighed.^[73,74]

Antimicrobial Activity: -

Agar cup plate method was used for screening of antimicrobial activity of herbal syrup. The formulations were placed aseptically in cups of agar plate which was previously inoculated with culture. The plates were left at ambient temperature for 30 min. prior to incubation at 37°C for 24 hrs. The antibiotic i.e. Amikacin was used as positive control for obtaining comparative results. Plates were observed after 24-48 hrs. incubation for the appearance of the zone of inhibition. Antimicrobial activity was evaluated by measuring the diameter of zones of inhibition (millimeters) of microbial growth

Dry Residue: -

Five mL of the syrup was placed in the oven (110°C). After two hours and cooling in a desiccator, the sample was weighed. The process was repeated as described earlier to achieve a constant weight, and dry residue was calculated. This procedure was repeated three times.

Sedimentation: -

Three samples were centrifuged at 5600 rpm for 15 min. The sediment was removed from the solution, dried at 120°C in an oven, and weighted after cooling.^[66]

Total Phenolics Content: -

Since most of the species used for preparing the syrup contain phenolic compounds, total phenolics content of the syrup was considered for standardization of the product. The test was performed according to British Pharmacopoeia by using pyrogallol as the standard material and Folin-Ciocalteu as the reagent.^[67,68] Quantification was carried out based on the standard curve of pyrogallol. Results were recorded as mg of pyrogallol equivalent per 100 mL of syrup. All

evaluations were made three times at room temperature.

Density: -

It was evaluated by Formula as given below;

Formula for density:

Density of liquid under test(syrup) = weight of liquid under test / volume of liquid under test

Specific Gravity: -

Specific gravity at 25°C

A thoroughly clean and dry Pycnometer was selected and calibrated by filling it with recently boiled and cooled water at 25°C and weighing the contents. Assuming that the weight of 1 ml of water at 25°C when weighed in air of density 0.0012 g/ml was 0.99602 g. The capacity of the Pycnometer was calculated. Adjusting the temperature of the final syrup to about 20°C and the Pycnometer was filled with it. Then the temperature of the filled Pycnometer was adjusted to 25°C, any excess syrup was removed and weight was taken. The tare weight of the Pycnometer was subtracted from the filled weight. The weight per milliliter was determined by dividing the weight in air, expressed in g, of the quantity of syrup which fills the Pycnometer at the specified temperature, by the capacity expressed in ml, of the Pycnometer at the same temperature. Specific gravity of the final syrup was obtained by dividing the weight of the syrup contained in the Pycnometer by the weight of water contained, both determined at 25°C.^[69,70]

Specific Gravity was evaluated by the formula as given below

Specific gravity of liquid under test (syrup) = weight of liquid under test / weight of water

Viscosity: -

Thoroughly clean Ostwald viscometer with warm chromic Acid and if necessary used.

1. An organic solvent such as acetone.
2. Mount viscometer in vertical position on suitable stand.
3. Fill water in dry viscometer up to mark G.



4. Count time required, in second for water to flow from mark A to mark B.

5. Repeat step 3 at least three times to obtained accurate reading.

6. Rinse viscometer with test liquid and then fill up to mark A, find out the time required for liquid to flow to mark B.

7. Determination of densities of liquid as mentioned in density determination experiment.

Formula for viscosity: $\text{Density of test of liquid} \times \text{Time required to flow test liquid}$

$\text{Viscosity} = \times \text{viscosity of water}$

$\text{Density of water} \times \text{time required to flow water}$

Turbidity Test: -

It is used to determine the concentration of suspended particle in a sample of water by measuring the incident light scattered at right angle from the sample. The scattered light is captured by photodiode which produce an electronic signal that is converted to turbidity.

Visual Inspection: -

With the visual inspection, the ingredient & the final product are carefully examined for purity & for appearance Physical appearance of product for patient adherence compliance is critical so that it should be good looking & elegance in appearance.

Determination Of Ph

Placed an accurately measured amount 10 ml of the final syrup in a 100 ml volumetric flask and made up the volume up to 100 ml with distilled water. The solution was sonicated for about 10 minutes. pH was measured with the help of digital pH meter.

Stability Testing: -

Stability testing of the prepared herbal syrup was performed on keeping the samples at accelerated temperature conditions. Nine portions of the final syrup (1A, 1B, 1C, 2A, 2B, 2C, 3A, 3B and 3C), were taken in amber colored glass bottles and were kept at accelerated temperature at 4⁰C, Room temperature and 47⁰C respectively. The samples

were tested for all the physicochemical parameters, turbidity and homogeneity at the interval of 24 hr, 48 hr and 72 hr to observe any change.^[71,72, 73, 74]

RESULT: -

The herbal syrup was successfully formulated using a combination of natural extracts, including Terminalia chebula, licorice, fennel, and other medicinal plants known for their digestive benefits. The syrup underwent physicochemical evaluations, such as tests for pH, viscosity, density, specific gravity, and total phenolic content, all of which met the quality parameters outlined in the British Pharmacopoeia. The syrup demonstrated stability through sedimentation and dry residue tests, and its macroscopic characteristics like color, odor, and taste were deemed acceptable. The selected ingredients provided synergistic effects, enhancing digestive health by alleviating symptoms like constipation, bloating, and acid reflux, while also offering anti-inflammatory and antioxidant benefits. The herbal syrup is a safe, effective, and natural alternative to synthetic medications, making it suitable for both pediatric and adult populations. Its ease of preparation and minimal side effects highlight its potential as a holistic remedy for common digestive ailments.

COLCLUSION: -

The formulated herbal syrup shows promising potential as a natural remedy for common digestive issues, leveraging the synergistic effects of its plant-based ingredients. With advantages like safety, ease of preparation, and efficacy for conditions such as constipation, acid reflux, and bloating, it serves as a viable alternative to chemical medications. Further clinical trials may strengthen its positioning as a mainstream digestive aid.

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