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Scientific Investigation of Avipattikar Churna: Traditional Remedy for Hyperacidity Relief

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Abstract:
Avipattikar Churna is a traditional Ayurvedic polyherbal formulation commonly used for the treatment of hyperacidity, gastritis, indigestion, and constipation. The present study was carried out to evaluate its quality and therapeutic potential through physicochemical analysis, phytochemical screening, chromatographic profiling, and anti-ulcer activity assessment. Physicochemical parameters such as moisture content, total ash, acid-insoluble ash, pH, and extractive values were determined according to standard Ayurvedic guidelines. The results showed that all parameters were within acceptable limits, indicating good quality and purity of the formulation.
Preliminary phytochemical screening revealed the presence of important bioactive constituents including alkaloids, flavonoids, phenolics, tannins, glycosides, saponins, and essential oils. HPTLC fingerprint analysis confirmed the presence of marker compounds such as piperine and gallic acid, which contribute to the therapeutic activity of the formulation.
The anti-ulcer activity of Avipattikar Churna was evaluated using the pylorus ligation model. The formulation showed a significant reduction in gastric volume, acidity, and ulcer index compared to the control group, indicating its gastroprotective and antacid properties. The formulation also exhibited antioxidant activity, which may help protect the gastric mucosa from oxidative damage.
The findings of this study support the traditional use of Avipattikar Churna in the management of hyperacidity and other gastric disorders. The formulation demonstrated promising anti-ulcer, antioxidant, and acidity-reducing effects, suggesting its potential as a safe and effective Ayurvedic remedy.

Keywords: Avipattikar Churna, Ayurveda, Hyperacidity, Gastritis, Anti-ulcer Activity, Antioxidant Activity, Phytochemical Screening, HPTLC, Gastroprotective Effect, Polyherbal Formulation.

INTRODUCTION:

Amlapitta (Hyperacidity)

According to Shrikanthdutta's description in Madhava Nidana, "Amlapitta" is the state in which the Amla guna of Pitta increases when different pitta prakopaka nidana sevan is performed.Amlapitta is the utpatti of vyadhi that results from pitta vitiation, which also causes the pitta's katu rasa to change into an amla rasa and raises its dravta. The excessive consumption of Amla (sour), Katu (spicy), Ushna (hot), and Viruddhashana (incompatible food combinations) can lead to an aggravation of Pitta dosha. Normally, Pitta has a Katu rasa (spicy taste), but when it is converted into Amla rasa (sour taste), it results in Amlapitta.[5]

According to Ayurveda, disease is caused when there is vitiation of AGNI, DOSH, DHATU, MAL, and MANA. When the equilibrium of these factors is disturbed it is called as VIKAR. When equilibrium is restored is called as SWASTHA. To maintain this condition of absolute metaphysical fitness Ayurveda, has described preventive measures which are there in nature through various directions like AHAR, VIHAR and ACHAR. According to the factor Agni carries great importance. Agni plays powerful role in

physiological functioning of body. Jatharagni plays the major role and the Bhutagnis and Dhatvagnis are dependent upon it. Any alteration in the factor of Agni causes ROGA. Mandagni is the main root cause of all diseases Mandagni leads to Ajeerna. Ajeerna if neglected gives rise to viscous cycle called as AMLAPITTA. AMLAPITTA vyadhi is a very common problem in socioeconomically developed as well as undeveloped countries. Though the intensity of this disease is not very high but its volume is very large. According to Ashtanga hrudaya, pitta dosha is described as: katu, amla rasatmak, tikshana, ushana, lahgu, visra, drava etc. When the Amla and Drava gun of Pitta dosha becomes exaggerated there is a sour blenching and this condition is regarded to be pathological condition termed as AMLAPITTA.([6]

❖ **Types of AMLAPITTA are:**

1. Urdhwaga.
2. Adhoga.
3. According to dosh sansarga: Vatanubandhi.
4. Kaphanubandhi.
5. Vatkaphanubandhi.

According to modern medicine these condition is called as HYPERACIDITY. This is caused due to diet, smoking, stress, 1iver diseases, and genetic factors. Hyperacidity leads to Gastric as well as Duodenal ulcers. According to modern medicine the treatment for Hyperacidity is traditional antacids associated with increase in Milk intake. Anticholinergic, Antrenyl are used, drugs like Cimetidine, Ranitidine were used, and every day one will find new drugs coming for it.[6]

Hyperacidity or Amlapitta is a very common disorder which affects almost 30% people in India as well as European countries each year. Hyperacidity could be described as a disorder of the modern and urban cities, where the eating habits of people are quite irregular. Hyperacidity (Amlapitta) simply means increase of acidity in the stomach. Normally Hydrochloric acid (HCl) secrets in the stomach of human body for the digestion of food, while it secretion has excess amount the condition is called as hyperacidity or acid dyspepsia. Excessive intake of oily, spicy and salty foods; excessive intake of sour foods that contain high acid content, inadequate exercise; go to bed immediately after a heavy meal, too much mental stress and worries; consumption of alcohol, smoking and drug addiction and too much intake of therapeutic allopathic medicines are triggers of hyperacidity (Amlapitta).[7]

❖ **Common Causes of Hyperacidity:**

Understanding the common causes of hyperacidity can help in choosing the right hyperacidity treatment and making lifestyle adjustments.

➢ **Poor Eating Habits :**

1) Eating large meals late at night.
2) Skipping meals or irregular eating patterns.
3) Eating too quickly without proper chewing.

➢ **Stress and Sleep Deprivation :**

High levels of stress increase acid production in the stomach. Inadequate sleep affects digestion and worsens hyperacidity, especially hyperacidity at night.

➢ **Spicy and Oily Food :**

Foods that are deep-fried or heavily spiced can overstimulate acid production, leading to a hyperacidity attack.

➢ **Smoking and Alcohol :**

Nicotine and alcohol weaken the lower esophageal sphincter, allowing acid to travel upwards, contributing to hyperacidity and GERD (Gastroesophageal Reflux Disease).

➢ **Long Gaps Between Meals :**

When the stomach stays empty for long durations, it can result in the accumulation of gastric acids, worsening acidity.

❖ **Certain Medications**

Painkillers, anti-inflammatory drugs, and antibiotics are known to irritate the stomach lining and trigger hyperacidity symptoms.[8]

Avipattikar Churna

Avipattikar Churna is a traditional Ayurvedic remedy renowned for its effectiveness in alleviating digestive issues, including acidity, gastritis, and indigestion. Made from a potent blend of finely ground herbs, it supports overall gut health. This natural remedy helps manage symptoms like acidity, constipation, bloating, and indigestion. By balancing the Pitta dosha, which governs digestion and metabolism, Avipattikar Churna promotes a healthy digestive system and sustains optimal body energy levels. It may also help alleviate abdominal discomfort and bloating by reducing inflammation and facilitating the elimination of trapped gas.Avipattikar churna is an Ayurvedic formulation used for centuries to manage the imbalance of Pitta dosha in the body. This formulation combines a variety of very effective Ayurvedic herbs with characteristic features that improve digestion in a purely natural way. The therapeutic value of Avipattikar Churna has long been recognized in its ability to regulate the digestive system and strike a balance in our body´s natural energies, especially the Pitta dosha that governs digestion and metabolism.[9]

Many polyherbal formulations are described in the diseases of Gastrointestinal tract. Amlapitta is a most commonly encountered disease in the clinical practice.Acharya Sushruta has mentioned that amla rasa is the quality of vidagdha pitta. Amlapitta may be correlated with various presentations of gastroesophageal and gastrointestinal diseases like gastritis, hyperacidity, heartburn, dyspepsia, and gastric ulcer. Ayurveda also highlights the role of digestive enzymes (agni) in the genesis of almost all diseases. Agnimandya (Low fire) is the prime cause of all diseases. Avipattikar churna is Churna is a rational composition of herbs formulated to strengthen jataragni (digestion power) with subsidiary effect on pitta and also expels excessive pitta by its mild laxative action. Avipattikara Churna comprises shunthi, maricha, pippali, haritaki, bibhitaki, amalaki, musta, vida lavana, vidanga, tamala patra, ela, lavanga, trivrut, and khandasharkara. It is indicated in qgnimandya (digestive impairment), vibandha (constipation), amlapitta (hyperacidity), arsha (piles), mutraghata (retention of urine), and prameha (diabetes mellitus).[10]

Tablet

These are solid dosage forms of medicament or medicaments which are prepared by moulding or by compression. Certain excipients are also added to the medicaments in the formulation of tablets. The compressed tablets are prepared in bulk by the large-scale production methods. (Detail is given in the chapter, "Processing of Tablets").[11]

❖ **Types of Tablet :-**

Tablets are classified according to their route of administration or function. The following are the four main classification groups:

A. Tablets ingested orally :

1. Compressed tablets.
2. Multiple compressed tablets or press coated tablets.
3. Multilayered tablets.
4. Sustained action tablets.
5. Enteric coated tablet.
6. Sugar coated tablets.
7. Film coated tablets.
8. Chewable tablets.

B. Tablets used in the oral cavity :

1. Buccal tablets.
2. Sublingual tablets.
3. Lozenge tablets and traches.
4. Dental cones.

C. Tablets administered by other routes :

1. Implantation tablets.
2. Vaginal tablets.

D. Tablets used to prepare solutions :

1. Effervescent tablets.
2. Dispensing tablets.
3. Hypodermic tablets.
4. Tablet triturates.[11]

❖ **Advantages of Tablets :-**

1. The tablets are easy to be administered.
2. They are easy to be dispensed.
3. These are more stable dosage form.
4. They maintain the accuracy of dosage.
5. Bitter and nauseous substances can be given easily in tablet form after giving a suitable coating to the tablets.
6. They are the lightest and the most compact of all dosage forms.
7. Of all the dosage form, tablets are easiest and the cheapest as regard packing and transport.
8. They are better suited to a large scale production as compared with any other unit oral dosage form.
9. These are an economical dosage form.
10. They have longer expiry period due to lower moisture content
11. They are more temper proof in comparison to capsule.[11]

❖ **Disadvantages of Tablets :-**

1. Some drugs resist compression into tablet form due to their amorphous nature or low density character.
2. Bitter tasting drugs, drugs with objectionable odour or drugs that the sensitive to oxygen or atmospheric moisture may require encapsulation or a special type of coating which may increase the cost of the finished tablets.
3. Drugs with poor wetting and slow dissolution properties are difficult to convert into tablets which provide full drug bioavailability.
4. The tablets cannot be used in case of emergency cases, because the rate at which active ingredient reaches the site to be treated slow.
5. Bioavailability of some drugs may be low due to poor absorption from the gastric tract.[11]

Chewable tablets

These tablets are chewed in the mouth and broken into smaller pieces. In this way, the disintegration time is reduced and the rate of absorption of the medicament is increased e.g. aluminium hydroxide tablets and phenolphthalein tablets.[11]

According to the United States Pharmacopoeia (USP), chewable tablets are oral dosage forms intended to be chewed and then swallowed by the patient rather than swallowed whole. The USP differentiates two types of chewable tablets: those that may be chewed for ease of administration and those that must be chewed or crushed before swallowing to avoid choking and/or to ensure the release of the active ingredient . The Japanese Pharmacopoeia defines chewable tablets as “tablets which are administered by chewing”,

while for the European Pharmacopoeia (EP), chewable tablets "are intended to be chewed before being swallowed".[12]

In general, chewable tablets have a smooth texture, offer a pleasant taste and, ideally, should not leave a bitter or pungent aftertaste. These dosage forms combine the advantages of conventional tablets in terms of manufacturability, dosing accuracy, portability and long-term stability, whilst providing favourable organoleptic and administration benefits. Chewable tablets may be preferred over conventional tablets and capsules when the required dose is high and the dosage form would be too big to pass through the oesophagus. They should be designed to be palatable and easy to chew and swallow. This is a useful patient-centric advantage, which can improve adherence to treatment, especially in patients who are unable or reluctant to swallow intact tablets or capsules due to their size or because of a disease condition.[12]

❖ **Advantages 0f chewable tablets :-**

1. Better bioavailability through bypassing disintegration (that increase dissolution).
2. Improved patient acceptance (especially Pediatric) through pleasant taste.
3. Patient convenience; need no water for swallowing.
4. Possible to use as a substitute for liquid dosage forms where rapid onset of action is needed.
5. Absorption of drug is faster.
6. Product distinctiveness through marketing prospective.
7. The large size of the dosage form is difficult to swallow. In such cases chewable tablet offers advantages over it.
8. Effectiveness of therapeutic agent is improved by the reduction in size that occurs during mastication of tablet before swallowing.[13]

❖ **Disadvantages of chewable tablets :-**

There are, of course some limitations to the use of chewable tablets having bad tasting drugs and extremely high dosage level. Some disadvantages of chewable tablet are :

1. It contains sorbitol which causes diarrhoea and flatulence.
2. Flavouring agents present in chewable tablet may causes ulcer in oral cavity.
3. Prolonged chewing of chewable tablet results in pain in facial muscles.
4. They are hygroscopic in nature, so must kept in dry place.
5. They show the fragile, effervescence granules property.
6. Since these tablets have insufficient mechanical strength, so careful handling is required.
7. They require proper packaging for safety and stabilization of stable drugs.[13]

Literature Review

K.D. Tripathi (2019)

Described hyperacidity as a common gastrointestinal disorder caused by excessive secretion of gastric acid. Common symptoms include heartburn, acid reflux, epigastric pain, bloating, and indigestion. The author explained the physiological mechanisms responsible for gastric acid secretion and discussed various treatment approaches, including antacids, H_2 receptor antagonists, and proton pump inhibitors. The book also highlights complications associated with untreated hyperacidity, such as gastritis and peptic ulcer disease. This reference provides a scientific foundation for understanding hyperacidity and evaluating alternative treatment options like Ayurvedic formulations.

1. **Jatin Kumar et al. (2024)**

Kumar et al. (2024) provided a detailed overview of Avipattikar Churna, a classical Ayurvedic formulation used for the management of Amlapitta and hyperacidity. The authors discussed its composition, therapeutic applications, and pharmacological properties. According to the review, the formulation contains several medicinal herbs with digestive, antioxidant, anti-inflammatory, and gastroprotective activities. The study highlighted that Avipattikar Churna helps regulate gastric acid secretion, improves digestion, and relieves symptoms such as heartburn, acid reflux, and indigestion. The authors concluded that it is a promising herbal remedy for gastrointestinal disorders.

2. **Alpana Kulkarni et al. (2021)**

Kulkarni et al. (2021) evaluated the antacid potential of an Ayurvedic polyherbal formulation used in functional dyspepsia and hyperacidity. The study demonstrated significant acid-neutralizing activity and effectiveness in reducing gastric acidity. The authors reported that the herbal ingredients contributed to the formulation's gastroprotective and digestive properties. The findings suggested that polyherbal preparations can serve as effective alternatives to conventional antacids. Furthermore, the study emphasized the importance of scientific evaluation of traditional medicines to establish their efficacy and safety for managing acid-related gastrointestinal disorders.

3. **Prashant Minhas (2025)**

Minhas (2025) conducted an integrated review of Avipattikar Churna and summarized its therapeutic significance in Ayurveda. The review highlighted its role in balancing aggravated Pitta Dosha and managing digestive disorders such as hyperacidity, indigestion, and constipation. The author discussed the pharmacological activities of individual ingredients and their synergistic effects in improving gastrointestinal health. The review also emphasized the formulation's antacid, anti-inflammatory, and antioxidant properties. The author concluded that Avipattikar Churna remains one of the most widely used Ayurvedic remedies for acid-peptic disorders.

4. **Geeta G. Gadad and K.S. Gudaganatti**

Gadad and Gudaganatti presented a comprehensive review of Avipattikar Churna and discussed its pharmacological importance. The authors reported that the formulation possesses antioxidant, anti-inflammatory, anti-secretory, and anti-ulcer properties. These activities help reduce gastric acid secretion and protect the gastric mucosa from damage. The review emphasized the role of Avipattikar Churna in managing Amlapitta and other digestive disorders. The authors also analyzed available experimental and clinical evidence supporting its therapeutic benefits. The review concluded that the formulation has considerable potential as a natural treatment for hyperacidity.

5. **Sharmili V. Suryavanshi et al. (2015)**

Suryavanshi et al. (2015) conducted a prospective interventional study to assess the effectiveness of Avipattikar Churna in patients with Amlapitta. The study evaluated symptoms such as heartburn, sour belching, nausea, and abdominal discomfort before and after treatment. Significant improvement was observed in most patients following therapy. The authors suggested that the formulation improves digestive function and reduces excessive gastric acidity. No serious adverse effects were reported during the study period. The findings support the clinical effectiveness and safety of Avipattikar Churna in managing hyperacidity and related gastrointestinal disorders.

6. Mangal A. Jadhav et al. (2016)

Jadhav et al. (2016) studied the effectiveness of Avipattikar Churna in combination with Kapardika Bhasma for the treatment of hyperacidity. The study involved patients experiencing symptoms such as acid reflux, burning sensation, and gastric discomfort. Significant symptomatic relief was observed after treatment. The authors reported that the combination improved digestive health and reduced gastric irritation. The study highlighted the synergistic effect of both formulations in managing Amlapitta. The results indicated that this Ayurvedic treatment approach is safe, effective, and beneficial for patients suffering from chronic hyperacidity.

7. Dr. Sumit Kumar and Dr. D.K. Mishra

Kumar and Mishra reviewed Amlapitta with special reference to hyperacidity and discussed its causes, symptoms, and Ayurvedic management. The authors explained that improper diet, stress, and unhealthy lifestyle habits contribute significantly to the condition. The review emphasized that Ayurvedic treatment focuses on correcting digestive disturbances and restoring physiological balance rather than simply suppressing acid secretion. Various herbal formulations, dietary modifications, and lifestyle recommendations were discussed. The study highlighted the importance of a holistic approach in the management of hyperacidity and related digestive disorders.

8. R.M. Mehta (Pharmaceutics)

Mehta discussed the basic principles of pharmaceutics, including dosage form design, formulation development, and pharmaceutical calculations. The textbook emphasizes the importance of selecting appropriate excipients and manufacturing techniques to ensure product quality and stability. These principles are highly relevant for the preparation and evaluation of herbal formulations. The author also described factors affecting drug delivery and patient acceptability. The information provided serves as a scientific basis for the development and standardization of pharmaceutical dosage forms, including herbal tablets and powders.

9. S.S. Shingade et al. (2024)

Shingade et al. (2024) reviewed chewable tablets and their significance in modern pharmaceutical dosage forms. The authors reported that chewable tablets improve patient compliance due to their ease of administration and pleasant taste. The review discussed formulation requirements, advantages, limitations, and evaluation parameters of chewable tablets. It also highlighted their suitability for pediatric and geriatric patients. The study concluded that chewable dosage forms offer a convenient alternative to conventional tablets and can enhance therapeutic effectiveness. The findings are useful in the development of herbal chewable formulations.

10. Rodriguez-Pombo et al.

Rodriguez-Pombo et al. reviewed recent innovations in chewable formulations and highlighted the application of 3D printing technology in pharmaceutical product development. The authors discussed how 3D printing allows customization of dosage forms according to patient requirements. Improved dose accuracy, product flexibility, and enhanced patient acceptability were identified as major advantages. The review emphasized the growing importance of advanced technologies in designing novel drug delivery systems. These developments provide new opportunities for producing effective and patient-friendly chewable formulations.

11. C.K. Kokate et al.

Kokate et al. emphasized the importance of pharmacognosy in the identification, authentication, and quality control of medicinal plants. The authors described various methods used for evaluating herbal drugs, including microscopic, macroscopic, and phytochemical analyses. Proper identification of plant materials is essential to ensure safety, purity, and therapeutic efficacy. The textbook also discussed the role of pharmacognostic studies in standardizing herbal formulations. This reference provides valuable information regarding the scientific evaluation of medicinal plants used in traditional medicines.

12. Puri H.S. (2003)
Puri (2003) discussed the therapeutic importance of Ayurvedic herbs in promoting longevity, rejuvenation, and overall health. The book highlighted the medicinal value of several herbs traditionally used for digestive disorders and gastrointestinal health. The author explained that many Ayurvedic plants possess antioxidant, anti-inflammatory, and protective properties that contribute to their therapeutic effectiveness. The text also emphasized the role of herbal formulations in maintaining physiological balance and preventing disease. This reference supports the traditional use of medicinal plants in digestive health management.

13. Kirtikar K.R. and Basu B.D. (2006)
Kirtikar and Basu (2006) provided detailed information on numerous Indian medicinal plants and their therapeutic applications. The authors described botanical characteristics, traditional uses, and pharmacological properties of several herbs commonly employed in Ayurvedic formulations. Many of these plants are known for their digestive, carminative, anti-inflammatory, and gastroprotective activities. The book serves as an important source of information for understanding the medicinal value of herbal ingredients used in Avipattikar Churna. It also supports the traditional use of medicinal plants in managing gastrointestinal disorders.

14. Md. R.H. Bulbul et al. (2022)
Bulbul et al. (2022) presented a comprehensive review on the pharmacological properties of *Terminalia chebula* (Haritaki), one of the important ingredients of Avipattikar Churna. The authors reported that Haritaki possesses antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, and gastroprotective activities. The review highlighted the presence of various bioactive compounds responsible for its therapeutic effects. Haritaki has traditionally been used in Ayurveda to improve digestion, relieve constipation, and maintain gastrointestinal health. The authors concluded that the plant has significant medicinal potential and supports its inclusion in formulations used for the management of digestive disorders such as hyperacidity.

15. Dr. Nidhi Garg and Dr. Akhil Jain
Garg and Jain reviewed the therapeutic and medicinal uses of *Terminalia bellirica* (Vibhitaka), an important constituent of Avipattikar Churna. The review described its antioxidant, anti-inflammatory, antimicrobial, and digestive properties. According to the authors, Vibhitaka helps improve gastrointestinal function and supports the management of various digestive disorders. The plant contains several phytochemicals that contribute to its medicinal activities. The review emphasized its traditional use in Ayurveda as part of the famous Triphala formulation. The authors concluded that Vibhitaka possesses significant therapeutic value and contributes to the effectiveness of Ayurvedic gastrointestinal remedies.

16. Gani et al. (2019)
Gani et al. (2019) reviewed the ethnomedicinal, phytochemical, and pharmacological properties of *Piper longum* (Pippali). The authors reported that the plant possesses antioxidant, anti-inflammatory, antimicrobial, anti-ulcer, and digestive stimulant activities. The review highlighted the presence of piperine and other bioactive compounds responsible for its pharmacological effects. Traditionally, Pippali has been used in Ayurveda to enhance digestion and treat gastrointestinal disorders. The authors concluded that its therapeutic properties support its use in herbal formulations intended for digestive health. These findings provide scientific evidence for the inclusion of Pippali in Avipattikar Churna.

17. A.K Agrawal et al. (2000)
Agrawal et al. (2000) investigated the effects of *Piper longum*, *Zingiber officinale*, and *Ferula* species on gastric ulceration and gastric secretion in rats. The study demonstrated significant reduction in ulcer formation and gastric acid secretion following treatment with these herbal extracts. The authors suggested that the anti-ulcer activity was associated with antioxidant and mucosal protective effects. The findings indicated that these medicinal plants help protect the gastric lining against damage caused by excessive acid production. The study provided experimental evidence supporting the traditional use of these herbs in the management of hyperacidity and peptic ulcer disease.

18. Qian-Qian Mao et al. (2019)

Mao et al. (2019) reviewed the bioactive compounds and pharmacological activities of *Zingiber officinale* (Ginger). The authors reported that ginger contains several active constituents, including gingerols and shogaols, which exhibit antioxidant, anti-inflammatory, antimicrobial, and gastroprotective properties. The review highlighted the beneficial effects of ginger in improving digestion and reducing gastrointestinal discomfort. Furthermore, ginger was found to protect gastric mucosa and reduce inflammation associated with digestive disorders. The authors concluded that ginger has considerable therapeutic potential and can be effectively utilized in formulations intended for the management of hyperacidity and other gastrointestinal conditions.

19. D. Sindhoora and A. Bhattacharjee

Sindhoora and Bhattacharjee reviewed the pharmacological profile of *Zingiber officinale* and discussed its medicinal importance in various health conditions. The authors reported that ginger possesses anti-inflammatory, antioxidant, antiemetic, and gastroprotective activities. The review emphasized its traditional use in digestive disorders, including nausea, indigestion, and gastric irritation. The plant's active constituents were found to contribute significantly to its therapeutic effects. The authors concluded that ginger is a valuable medicinal herb with wide-ranging pharmacological properties and plays an important role in promoting gastrointestinal health and relieving symptoms associated with hyperacidity.

20. Al-Mofleh et al.

Al-Mofleh et al. investigated the gastroprotective effect of *Foeniculum vulgare* (Fennel) on experimentally induced gastric lesions in rats. The study demonstrated that fennel treatment significantly reduced gastric mucosal damage and protected the stomach lining against chemically induced injury. The authors suggested that the protective effect was due to the antioxidant and anti-inflammatory properties of fennel. The study highlighted the potential of fennel as a natural remedy for gastric disorders associated with excessive acid secretion. These findings support its traditional use in digestive formulations and justify its inclusion in Ayurvedic preparations for hyperacidity management.

21. Beckett et al. (2020)

Beckett et al. (2020) conducted a double-blind, randomized, placebo-controlled study to evaluate the anti-heartburn effects of sugar cane flour. The results showed significant improvement in heartburn symptoms among participants receiving the treatment compared to the placebo group. The authors suggested that sugar cane flour may help reduce gastric irritation and provide symptomatic relief from acid reflux. The study highlighted the potential role of natural dietary ingredients in managing hyperacidity and related gastrointestinal discomfort. These findings support the traditional use of sugar-based ingredients in formulations intended to soothe the digestive system and reduce acidity symptoms.

COMPOSITION AND ROLE OF INGREDIENTS IN AVIPATTIKAR CHURNA

Avipattikar Churna is a traditional Ayurvedic remedy renowned for its effectiveness in alleviating digestive issues, including acidity, gastritis, and indigestion. Made from a potent blend of finely ground herbs, it supports overall gut health. (5) Avipattikar churna is Churna is a rational composition of herbs formulated to strengthen jataragni (digestion power) with subsidiary effect on pitta and also expels excessive pitta by its mild laxative action. Avipattikara Churna comprises shunthi, maricha, pippali, haritaki, bibhitaki, amalaki, musta, vida lavana, vidanga, tamala patra, ela, lavanga, trivrut, and khandasharkara. It is indicated in qgnimandya (digestive impairment), vibandha (constipation), amlapitta (hyperacidity), arsha (piles), mutraghata (retention of urine), and prameha (diabetes mellitus). [10]

INGREDIENTS

1. Amalaki (Emblica officinalis) :-

- Biological Name : Phyllanthus emblica Linn.
- Common Name : Amalaki , Indian Gooseberry.
- Kingdom : Plantae.
- Order : Malpighiales.
- Family : Phyllanthaceae.
- Genus : Phyllanthus.
- Species : emblica.

❖ Synonyms :-

Emblica, Indian goose berry, Amalika.[14]

❖ Biological Source :-

This consists of dried, as well as fresh fruits of the plant Emblica officinalis Gaerth Phyllanthus emblica Linn. belonging to family Euphorbiaceae. It contains not less than 1.0 per cent w/w of gallic acid calculated on dry basis.[14]

❖ Geographical Source :-

It is a small or medium size tree found in all deciduous forests of India. It is also found in Sri Lanka and Myanmar. The leaves are feathery with small oblong pinnately arranged leaflets. The tree characteristic greenish grey with smooth bark.[14]

❖ Macroscopic characters :-

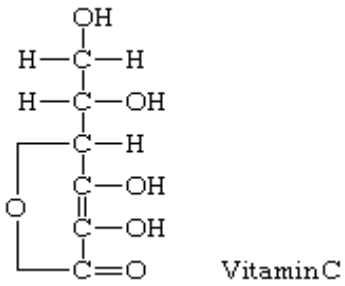
- Colour: Fruits are the green colour changes to light yellow or brick red at maturity.
- Odour : Odourless.

- Taste: The taste of Amla is sore and astringent.
- Size: The average size of an Amla is between 1.5 and 2.5 cm in diameter.
- Shape: The fruits are depressed, globular. [14]

❖ Chemical Constituents :-

Amla fruit is a rich natural source of vitamin C (Ascorbic acid) and Contains 600 750 mg per 100 g of the fresh pulp. Furthermore, fruits also contain about 0.5 per cent fat, phyllemblin and 5 per cent tannin. Amla fruits are also rich in mineral matters like phosphorus, iron and Calcium, it contains appreciable amount of pectin. The fresh fruits contain about 75 per cent moisture. The fruits are dehydrated and stored. It is found that vitamin content of dried fruits is not lost considerably.

It may be due to the presence of tannins, which retards oxidation of vitamin C. [14]



Vitamin C

❖ Standards of Quality :-

- FOM : Not more than 3.0 %.
- Total ash : Not more than 5.0 %.
- Acid insoluble ash : Not more than 2.0 %.
- Water soluble Extractives : Not less than 40.0 %.
- Alcohol Soluble extractives : Not less than 30.0 %. [14]

❖ Uses :-

Amla fruits are largely used in Indian medicines. It is used as an acrid, diuretic, refrigerant and laxative. Dried fruits are given in diarrhoea and dysentery. They are also administered in jaundice dyspepsia and anaemia along with iron compound. Fruits are also used in preparation of inks, hair oils and shampoo. It is reported that fixed oil from fruits possesses the property of promoting hair growth. Seeds of the fruits are given in treatment of asthma and bronchitis.

The leaves are used as fodder. Alcoholic extract of the fruit is anti-viral. It is a popular ingredient of 'Triphala' and 'Chyawanprash'. Amla, being a rich source of vitamin C, is considered important to slow the ageing process. It improves skin health. Ageing is a cumulative result of damage to various cells and tissues, mainly by oxygen free radicals. Vitamin C is a scavenger of free radicals which breaks them down. It has an antioxidant synergism with vitamin E (which prevents peroxidation of lipids). Amla is a major ingredient of ancient Ayurvedic preparation Chyawanprash believed to delay ageing process thereby adding to longevity. [14]

Amalaki is considered best among Rasayana so called Acharasayana. It clears all the three doshas present in the human body. A regular use of amalaki is presumed to prolong lifespans, up to 120 years for humans. Its use not only increases human life but also improves the quality. It imparts memory, balanced intellect, health, youth-fulness, lustrous body and a clear voice. It helps reduce tendencies for headaches, 5confusion of thought, psychic disorders and memory loss. Amla, when administered with ghee, honey and oil for one month, is a geriatric tonic for general debility, lack of disease resistance and memory loss. It overcomes the degenerative effects of old age. In winter, when vitality is low, amla with ashwagandha, ghee and honey is restorative and invigorating. A decoction of the fruit is useful in dyspepsia, chronic dysentery and diarrhoea. It is cooling and a refrigerant, diuretic and laxative. A sherbet of the fruit made with lemon juice helps acute dysentery, constipation, piles, enlarged liver and dropsy. Cases of hyperchlorhydria with burning sensation in the abdomen, cardiac and gastric regions benefited from application of the fruit powder. A decoction prepared by taking 5 g amla in 80 ml of water (reduced to 20 ml) was given after main meals to patients. There was significant relief in symptoms after 30 days. When water extract of amla was administered to patients of hyperhidrosis, excellent results were achieved in 29 of 40 cases. [15]

2. Haritaki (Terminalis chebula) :-

- Biological Name : Terminalia chebula.
- Common Name : Haritaki , Harad.
- Kingdom : Plantae.
- Order : Myrtales.
- Family : Combretaceae.
- Genus : Terminalia.
- Species : chebula.

❖ Synonyms :-

Chebulic myrobalans, Harde, Haritaki. [14]

❖ Biological Source :-

It consists of dried, ripe, and fully matured fruits of Terminalia chebula Retzr belonging to family Combretaceae. It contains not less than 5.0 per cent of chebulagic acid and not less than 22.5 per cent of chebulinic acid. [14]

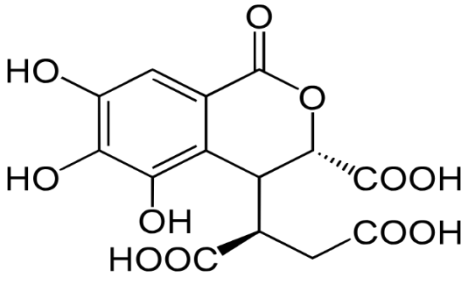
❖ Geographical Source :-

Myrobalan tree is found in the sub-Himalayan tracks from Ravi to West Bengal, Assam and in all deciduous forests of India, specifically in Madhya Pradesh, Maharashtra, Bihar and Assam. [14]

❖ Macroscopic characters :-

- Colour : Fruits are yellowish-brown.
- Odour : Odourless.
- Taste : Astringent, slightly bitter and sweetish at the end.
- Size : 20 to 25 mm long and 15 to 25 mm wide.
- Shape : Ovate and wrinkled longitudinally. [14]

❖ Chemical Constituents :-



Myrobalan fruits are an important source of tannin. Depending upon the geographical source, they vary in tannin content and the fruits collected from Chennai are very rich in tannin. The approximate analysis of the fruits is as follows:

Moisture 10 per cent; Tannin 25-32 per cent;
Water insoluble matter 40-50 per cent

The tannins of myrobalans are of pyrogallol type Chebulic acid (hydrolysable tannins), which yield chebulic acid and d-galloyl glucose on hydrolysis. Chebulagic, chebulinic, ellagic and gallic acids are the other contents of myrobalans. Myrobalan also contains glucose and sorbitol (about 3.5 per cent). During the maturation of the tree, the amount of tannin decreases, whereas the acidity of the fruits increases. [14]

- ❖ Standards of Quality :-
  - ○ Total ash : Not more than 5.5 %.
  - ○ Acid insoluble ash : Not more than 0.5 %.
  - ○ LOD : Not more than 9.0 %.
  - ○ Alcohol soluble extractives : Not less than 40.0 %.
  - ○ Water soluble extractives : Not less than 56.0 %. [14]
- ❖ Uses :-

Myrobalan is used mainly as an astringent, laxative, stomachic and tonic. The laxative property of Myrobalan is due to anthracene derivative present in the pericarp. It is also an anthelmintic. Fruit pulp is used to cure bleeding. It is an ingredient of ayurvedic preparation 'Triphala', used for treatment of variety of ailments. Commercially, it is used in dyeing and tanning industry and also in the treatment of water used for locomotives. Myrobalan is also used in the treatment of piles and external ulcers. [14]

There are seven varieties. The fruit is dry and heating: stomachic, tonic, carminative, expectorant, anthelmintic, antidysenteric, alterative; useful in asthma, sore throat, thirst, vomiting, hiccough, eye diseases, diseases of the heart and the bladder, strangury, vesicular calculi, urinary discharges, ascites, biliousness, inflammations, tumours, bleeding piles, typhoid fever, leukoderma, dyspepsia, itching, pain, constipation, anemia, gout, elephantiasis, delirium (Ayurveda). [16]

Traditionally, T. chebula has improved gastrointestinal motility and alleviated constipated bowel habits and comfort. T. chebula significantly decreases overall gastric lesions and gastric juice volume while increasing gastric pH and mucus release in different physical and chemical stress-induced ulcer models. Gastroprotective activity of T. chebula was confirmed as chebulinic acid (CA), a significant component from its extraction elevated the mucus production level and inhibition of H^+-K^+ ATPase activity. The antiulcerogenic action of T. chebula was balanced with a protective impact upon the gastrointestinal mucosa and the improvement in the secretory condition of Brunner's glands. It is attributed to giving protection against duodenal ulcers. Another study to assess the potential antiulcerogenic effect of T. chebula, methanol fruit extract on animal models was explored, which resulted in the significant inhibitory action of gastric ulceration through degeneration, haemorrhage and edematous appearance of the gastric tissue. An investigation revealed that CA derived from T. chebula notably possesses gastroprotective and antisecretory action. Due to the presence of chebulagic acid and polyphenols, it was found that T. chebula upregulates the expression of VEGF/MMP-2 and alleviates the healing of ethanol-induced gastric ulceration. Helicobacter pylori are highly adaptive to the human stomach, with many unique characteristics that allow it to enter mucus, directed swimming and multiplication in mucus, attached to the epithelium cells, escape immune responses and as a result, persistent colonisation and transmission. Treatment with T. chebula either may eradicate H.pylori or increase the secretory status of the Brunner's gland or by inhibiting its attachment by increasing surface hydrophobicity or upregulating mucin secretion, and inhibiting proton pump or solid inhibitory activity against IL-8 secretion, suggesting gastrointestinal protection against H. pylori. [17]

3. Bibhitaki (Terminalia bellirica) :-

- Biological Name : Terminalia bellirica.
- Common Name : Baheda, Bahera.
- Kingdom : Plantae.
- Order : Myrtales.
- Family : Combretaceae.
- Genus : Terminalia.
- Species : bellirica.

❖ Synonyms :-

Bellaric myrobalan, Baheda, Bibhitak are other names for Bibhitaki. [14]

❖ Biological Source :-

It consists of dried ripe fruits of the plant Terminalia belerica Linn. belonging to family Combretaceae, and should contain not less than 0.3 per cent of ellagic acid and 0.75 per cent of gallic acid in dried form. [14]

❖ Geographical Source :-

The tree is found in all the decidous forests of India, up to an altitude of 1000 m. It is found in abundance in Madhya Pradesh, Uttar Pradesh, Punjab; Maharashtra and in Sri Lanka and Malaya also. [14]

❖ Macroscopic Characters :-

- Colour : Fruits are dark brown to black.
- Odour: None.
- Taste: Astringent.
- Size : 1.3 – 2 cm in length.
- Shape: Fruits are globular and obscurely 5 angled.

The fruits are pulpy with hard and stony seeds. [14]

❖ Chemical Constituents :-

The fruits contain about 20-30 per cent of tannins and 40 45 per cent water-soluble extractives. It also contains colouring matter besides gallic acid, ellagic acid, phyllemblin, and ethyl gallate and galloyl glucose. The seeds contains non-edible oil. The plant produces a gum. It also contains most of the sugars as reported in myrobalan. [14]

❖ Standards of Quality :-

- Total ash : Not more than 4.5 %.
- LOD : Not more than 10.0 %.
- Acid insoluble ash : Not more than 0.2 %.
- Alcohol soluble extractives : Not less than 17.0 %.

- Water soluble extractives : Not less than 26.0 %.
- Loss on drying : Not more than 10.0 %. [14]

❖ Uses :-

Bahera is used as an astringent and in the treatment of dyspepsia and diarrhoea. It is a constituent of triphala. The purgative property of half ripe fruit is due to the presence of fixed o The oil on hydrolysis yields an irritant recipe, Gum is used as a demulcent and purgative. Oil is used for the manufacture of soap. [14]

The fruit is bitter; astringent, tonic, attenuant, aperient, anti-pyretic; useful in dyspepsia, bilious headache, diarrhoea; applied to the eyes, to piles; brain tonic (Yunani). In the Konkan, the kernel, with that of the marking nut, is sometimes eaten with betel-nut and leaf in dyspepsia; the fruit also is used as an astringent, usually in combination with chebulic myrobalans. There is no doubt about the narcotic properties of the kernel. The part used in medicine is the pulp. In the Punjab, it is chiefly employed in dropsy, piles, diarrhoea and leprosy; also occasionally in fever. When half ripe, it is considered purgative, when fully ripe or dried, astringent. [16]

Known to be as one of the best tonics for the digestive system, Bibhitaki Juice keeps the system clean and resolves the digestive functions. It helps in improving conditions such as anorexia and diseases such as piles and worms in the digestive system. [18]

4. Pippali (Piper longum) :-

- Biological Name : Piper longum Linn.
- Common Name : Piapal, Long Pepper.
- Kingdom : Plantae.
- Order : Piperales.
- Family : Piperaceae.
- Genus : Piper.
- Species : longum.

❖ Synonyms :-

Pippali Large, Catkins (Big), Pan-pimpali. [14]

❖ Biological Source :-

This consists of dried fruiting spikes of climbing vine, called as Piper longum belonging to the family Piperaceae. It contains not less than 1.0 per cent of piperine on dried basis.

Varieties like Gajapippali, Cheemthipalli, Sihali pippali and Viswam are also known. [14]

❖ Geographical Source :-

In India, it is found in Bengal, Bihar, Annamaliai district of Tamilnadu and Cherapunji in Assam. Also in parts of East Nepal. It is also found in Singapore, Sri Lanka, Indonesia and Malaysia. It is native of Indo-Malaya region. [14]

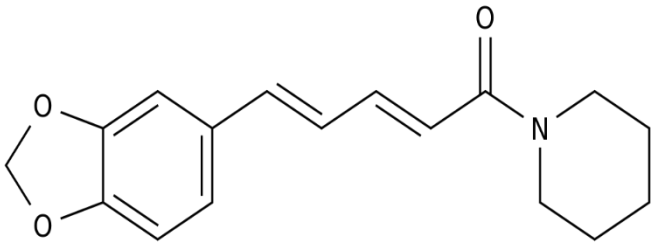
❖ Macroscopic Characters :-

- Colour : Pink brown to dark brown.
- Odour : Aromatic spicy.
- Taste : Hot and sweet taste.
- Size : 2 to 5 cm in length and 0.4 to 0.5 cm in diameter.
- Shape : Circular and elongated.

Spikes are cylindrical, erect and blunt. [14]

❖ Chemical Constituents :-

It consists of alkaloids piperine, piplartine and piplasterol (about 6 per cent), 1 per cent essential mil and pungent resin. Large variety contains not less than 1.0 per cent while small variety contains not less than 0.4 per cent of piperine. [14]



❖ Standars of Quality :-

- Total ash: Not more than 5.0 %.
- Acid insoluble ash : Not more than 0.6 %.
- WSE : Not less than 11.0 %.
- ASE : Not less than 12.0 %.
- LOD : Not more than 13.0 %. [14]

❖ Uses :-

It is widely used in Ayurvedic and Unani medicines, especially in diseases of respiratory tract. The roots are used for bronchitis, stomach-ache, diseases of spleen and tumours.

It improves appetite. It is also used in pickles. [14]

Pippali (Piper longum Linn), sringvera (Zingiber officianalis Linn) and hingu (Ferula species) are three plant drugs of the Dipanya mahakasaya group, which is one of the 50 great extracts used in Ayurveda. Drugs which increase the digestive fire are called as Dipanya. Fruits of pippali have been used as thermogenic, stomachic, aphrodisiac, carminative, expectorant, laxative, digestive, emmolient, antigiardiasis, antiamoebic and antiseptic. Rhizomes of sringvera are useful in anorexia, dyspepsia, abdominal discomfort and as appetiser, laxative, stomachic, rubefacient, anticancer, antiemetic and carminative. The oleoresin of hingu is bitter and acrid , carminative, expectorant, anthelmintic, digestive, sedative and is used in flautulent colic, dyspepsia and constipation. [20]

P. longum exhibits promising antioxidant potential against free radical-induced oxidative damage. Petroleum ether extract of the root and piperine from roots of P. longum Linn. decrease lipid peroxide levels and maintain glutathione content, demonstrating antioxidant activity. According to Stohr Piper extracts and piperine possess inhibitory activities on prostaglandin and leukotrienes COX-1 inhibitory effect and thus exhibit anti-inflammatory activity . [19]

5. Sunthi (Zingiber officinale) :-

- Biological Name : Zingiber officinale Roscoe.
- Common Name : Dry Ginger, Sonth (Hindi).
- Kingdom : Plantae.
- Order : Zingiberales.
- Family : Zingiberaceae.
- Genus : Zingiber.
- Species : officinale.

❖ Synonyms :-

Zingiber, Zingiberis, Sunthi. [14]

❖ Biological Source :-

Ginger consists of whole or cut, dried scrapped or unscrapped rhizomes of Zingiber officinale Roscoe, family Zingiberaceae. It contains not less than 0.8 per cent of total gingerols on dried basis. [14]

❖ Geographical Source :-

It is said to be native of South East Asia, but is cultivated in Caribbean islands, Africa, Australia, Mauritius, Jamaica, Taiwan and India. More than 35 per cent of the world's production is from India. [14]

❖ Macroscopic Characters :-

- Colour : Externally, it is buff coloured.
- Odour : Agreeable and aromatic.
- Taste : Agreeable and pungent.
- Size : Rhizomes of ginger are about 5 - 15 x 1.5 - 6.5 cm.
- Shape : The rhizomes are laterally compressed, bearing short flat, ovate and oblique branches on the upper side, with bud at the apex.
- Fracture : Short and fibrous. [14]

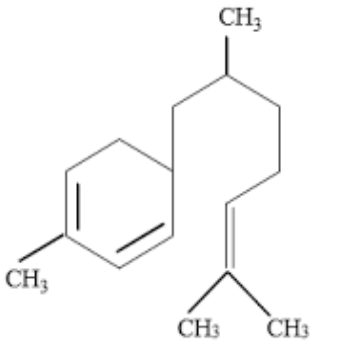
❖ Chemical Constituents :-

Ginger consists of volatile oil (1 - 4 per cent), starch (40 - 60 per cent), fat (10 per cent), fibre (5 per cent), inorganic material (6 per cent), residual moisture (10 per cent) and acrid resinous matter (5 - 8 per cent). Ginger oil is constituted of monoterpene hydrocarbons, sesquiterpene hydrocarbons, oxygenated mono and sesquiterpenes, and phenyl propanoids.

Sesquiterpene hydrocarbon content of all types of ginger oil from different countries is found to be same and includes α-zingiberene, β-bisabolene, α-farnesene, β-sesquiphellandrene and α-curcumene. [14]

❖ Standards of Quality :-

- Foreign organic matter : Not more than 2.0 %.
- Water soluble extractives : Not less than 10 %.
- Alcohol (90 per cent) soluble extractive : Not less than 4 %.
- Total ash : Not more than 6.0 %.
- Water soluble ash : Not less than 1.7 %.
- Acid insoluble ash : Not more than 2.0 %.
- Water : Not more than 12.0 %. [14]



Zingiberene

❖ Uses :-

Ginger is used as a stomachic, an aromatic, a carminative, stimulant and flavouring agent. Ginger oil is used in mouth washes, ginger beverages and liquors.

Ginger powder has been reported to be effective in motion sickness. It has been suggested that adsorbent, aromatic and carminative properties of ginger on G. I. tract cause adsorption of toxins and acid enhanced gastric motility. These may have probably blocking effects of G. I. reactions and nausea.

Z. officinale (Methanolic extract) has molluscicidal effects, possessing efficacy to control the parasitic infection viz. schistosomiasis. U.S. Food and Drug administration has included ginger as product that is generally regarded as safe (GRAS). [14]

It is an anti-oxidant, anti-microbial and acts as a preservative. Ginger extract reduced swelling and was as active as aspirin. Patients suffering from rheumatoid arthritis received relief using it. The pungent active constituent, gingerol, inhibited prostaglandin and leukotriene synthesis. It was a more potent inhibitor of prostaglandin biosynthesis than indomethacin. The essential oil of ginger inhibited chronic adjuvant arthritis in rats. It inhibited experimentally-induced gastric ulcers. Through its anti-microbial activity it prevented ulceration and inhibited the manufacture of prostaglandin.[15]

Ginger (Zingiber officinale Roscoe) is a common and widely used spice. It is rich in various chemical constituents, including phenolic compounds, terpenes, polysaccharides, lipids, organic acids, and raw fibers. The health benefits of ginger are mainly attributed to its phenolic compounds, such as gingerols and shogaols. Accumulated investigations have demonstrated that ginger possesses multiple biological activities, including antioxidant, anti-inflammatory, antimicrobial, anticancer, neuroprotective, cardiovascular protective, respiratory protective, antiobesity, antidiabetic, antinausea, and antiemetic activities. [21]

Ginger has been demonstrated to show antioxidant effects in vitro. The antioxidant component present in ginger appears to be (6)-gingerol, as it has been shown to protect HL-60 cells from oxidative stress. Ginger oil has H2O2-induced dominative protective effects on DNA damage. Ginger oil could act as a radical oxygen scavenger and could be used as an antioxidant. Ginger was found to inhibit prostaglandin biosynthesis and to interact with the vanilloid nociceptor and the inflammatory cascade. Ginger has been shown to share pharmacological properties with non-steroidal anti-inflammatory cascade. Ginger has been shown to share pharmacological properties with non-steroidal anti-inflammatory drugs (NSAIDs) because by cyclooxygenase-1 and cyclooxygenase-2 inhibition, it suppresses prostaglandin synthesis. However,

based on its ability to suppress leukotriene biosynthesis by inhibiting 5-lipoxygenase, ginger can be distinguished from NSAIDs. [22]

6. Fennel :-

- Biological Name : Foeniculum vulgare Mill.
- Common Name : Saunf, Badi Saunf.
- Kingdom : Plantae.
- Order : Apiales.
- Family : Apiaceae.
- Genus : Foeniculum.
- Species : vulgare.

❖ Synonyms :-

Fennel fruits, Fractus Foeniculum. [14]

❖ Biological Source :-

Fennel consists of dried ripe fruits of the plant known as Foeniculum vulgare Miller, family Umbelliferae, obtained by cultivation. It should contain not less than 0.6 per cent of anethole calculated on dried basis. [14]

❖ Geographical Source :-

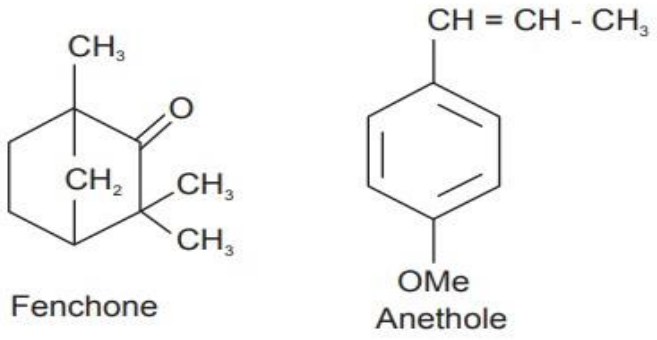
It is indigenous to mediterranean countries and largely cultivated in Romania, Russia, Germany, France, India and Japan. In India, it is cultivated in Gujarat, Punjab, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal. [14]

❖ Macroscopic Characters :-

- Calour : Green to yellowish-brown.
- Odour : Sweet aromatic.
- Taste : Strongly aromatic.
- Size : 5-10 x 2-4 mm.
- Shape : Straight or slightly curved. [14]

❖ Chemical Constituents :-

Fennel consists of 3 to 7 per cent of volatile oil, about 20 per cent each of proteins and fixed oil. The chief active constituent of the volatile oil is a ketone, fenchone (about 20 per cent) and a phenolic ether anethole (about 50 per cent). The other constituents are phellandrene, limonene, methyl chavicol, anisic aldehyde, etc. Fenchone is a colourless pungent liquid with aromatic odour. The anethole is sweet in odour and taste. Oil of fennel is pale yellow liquid with sp. Gr. 0.953 to 0.973, refractive index of 1.526-1.538 and optical rotation of+12° to +24°. [14]



❖ Standards of Quality :-

- Total Ash : Not more than 11.0 %.
- Acid insoluble ash : Not more than 1.5 %.
- Water soluble extractives : Not more than 10 %.
- Foreign organic matter : Not more than 1.5 %. [14]

❖ Uses :-

It is used as a carminative, aromatic and stimulant. It is also an expectorant. Pharmaceuticaly it is used as flavouring agent.

Indian exports of fennel oil during 1995-96 and 96-97 were Rs.17.5 lakhs and 14.00 lakhs respectively. [14]

Anti-gastric ulcer and anti-secretory effects of folkloric medicinal plant, Foeniculum vulgare L., (Family: Apiaceae) in rats. The gastric ulcer protective potential of an aqueous suspension of 'Fennel' Foeniculum vulgare (FVS) was evaluated against different acute gastric ulcer models in rats induced by pyloric ligation (Shay), hypothermic restraint stress, indomethacin and by necrotizing agents (80% ethanol, 0.2 M NaOH and 25% NaCl). Fennel suspension, 250 and 500 mg kg^{1} b.wt. administered orally (intraperitoneally in Shay rat model) showed a dose-dependent ulcer protective effects in all the above models. Besides, the FVS offered protection against ethanol-induced depletion of Gastric Wall Mucus (GWM); replenished the reduced nonprotein sulfhydryls (NP-SH) concentration and modulated malondialdehyde (MDA) contents in the gastric tissue. Ethanol induced histopathological lesions of the stomach wall characterized by mucosal haemorrhages and edema that was reversed by FVS. Pretreatment of rats with FVS provided significant protection of gastric mucosa through its antioxidant capacity and or by attenuating the offensive and by enhancing the defensive factor. [23]

7. Sugarcane :-

- Biological Name : Saccharum officinarum Linn.
- Common Name : Ganna (Hindi), Sugarcane.
- Kingdom : Plantae.
- Order : Poales.
- Family : Poaceae (Grass family).
- Genus : Saccharum.
- Species : officinarum.

❖ Synonyms :-

Ganna (Hindi), Sugarcane (English). [14]

❖ Biological Source :-

It is the plant Saccharum-officinarum fam. Graminae, important source of sugar. [14]

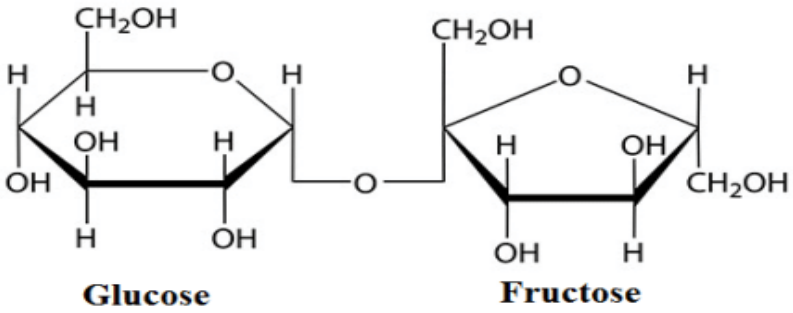
❖ Geographical Source :-

Sugar canes are commercially cultivated in Cuba, Lousiana, Moriceous, Phillipines, Hawai, Indonesia and India. Total world production of sucrose is equally divided between cane-sugar and beet-sugar. [14]

❖ Chemical Nature :-

Cane sugar or sucrose is odourless, white, crystalline solid colourless with sweet taste.

Sucrose is soluble in water, insoluble in alcohol. It is optically active and its specific rotations is +66.5. [14]



Glucose **Fructose**

❖ Uses :-

Sugar is as sweetening agent, demulant and nutrient in pharmaceutical and food industries. [14]

Gastroesophageal reflux disease (GERD) is symptomatically referred to as heartburn or reflux disease, where the stomach content can travel backwards towards the esophagus leading to gastric content attack on the tissue lining. The primary symptoms of GERD are heartburn and regurgitation, but individuals may

also suffer chest pain, nausea, bloating, belching, and water brash. Major contributing factors in the pathogenesis of GERD are reported as reduced esophageal motility, low esophageal clearance, and acidification of the esophagus . There is a large body of evidence that significant morbidity is associated with GERD, which is suggested to affect around 20% of Australians. GERD can cause drastic reductions in quality of life including lack of quality sleep, dysphagia and in severe cases, esophageal cancer. Current GERD treatments mainly consist of lifestyle changes, use of of acid antisecretory drugs and surgery. Proton pump inhibitors (PPI) are generally used for long term maintenance and treatment of reflux esophagitis . While PPIs work well in over half of the GERD patients, there is a refractory group that needs more effective alternative therapies. Additionally, recent studies have begun to raise concerns regarding the long-term effects correlated to the use of PPI's and the need for greater consideration and study of their risk profile. [24]

FORMULATION COMPOSITION

The herbal chewable tablet for acidity was formulated using Avipattikar Churna as the main active ingredient, combined with supportive herbs and natural excipients. The formulation details are as follows:

Sr. No.	Ingredients	Quantity (mg)
1	Avipattikar Churna (Polyherbal Churna)	500 mg
2	Sugarcane Extract (Saccharum officinarum)	100 mg
3	Fennel powder (Foeniculum vulgare)	100 mg
4	Microcrystalline cellulose	635 mg
5	Starch powder	100 mg
6	Starch paste	q.s.
7	Talc	20 mg
8	Magnesium stearate	10 mg
9	Ascorbic acid	5 mg
10	Methyl paraben	2 mg
Total		~1.5 g

Total Tablet Weight : 1.5 gm

EXCIPIENTS USED IN FORMULATION OF TABLETS

An excipient is an inert substance which is added along with medicaments to prepare the granules from the solid medicaments.

The following are some of the excipients which are generally required in the formulation of tablets:

1. Diluents
2. Granulating agents
3. Binding agents
4. Disintegrating agents
5. Lubricants
6. Adsorbents
7. Colouring agents, Flavouring agents and Sweetening agents.

1. Diluent:

The diluent is needed in the formulation of a tablet, when the quantity of medicament in each tablet is very small and it is not possible to make a good tablet. The commonly used diluents are lactose, sucrose, sodium chloride, dextrose and starch, mannitol, sorbitol. dibasic calcium phosphate dihydrate and calcium sulphate dihydrate.

2. Granulating agents :

These are used to convent the fine powder into granules. A granulating agent provided proper moisture to convert fine powder into damp mass, which after passing through a sieve of suitable number forms granules. The various granulating agents used are water, alcohol, mucilage of starch, mucilage of acacia, mucilage of tragacanth, gelatin solution, iso-propyl alcohol, acetone etc.

3. Binding agents:

These are used in granulation to provide proper strength to the granules, in order to keep the tablet intact after compression. The various binding agents used are gum acacia powder, gum tragacanth, gelatin, sucrose, methyl cellulose etc. Binding agents are used along with granulating agents. The selection of proper binding agent and its concentration depends on the type of the tablets for which it is used. In lozenge tablets and implants the proportion of binding agent has to be very high, whereas in other cases where the tablets has to disintegrate quickly a binding agent with less binding property and lower concentration is used.

4. Disintegrating agents:

The substances which are added in the tablet formulation to ensure disintegrating of the tablets into smaller particles when swallowed are called Disintegrating Agents. These are added into the formulation of or oral tablets or sublingual tablets. When the medicament is insoluble in water a disintegrating agent is needed. Disintegrating agents act in three ways:

(i) By swelling: Disintegrating agent gets swelled when it comes in contact with water or moisture e.g. potato starch, maize starch, wheat starch, methyl cellulose and bentonite. Potato starch is superior to other starches but maize starch is commonly used because it is very cheap.

(ii) By producing effervescence: They produce effervescence when they come in contact with moisture e.g. sodium bicarbonate, citric acid and tartaric acid.

(iii) They melt at body temperature e.g.cocabutter.

The disintegrating agent is generally divided into two parts. One part is mixed along with other excipients before the formation of granules. The other part is mixed with the dry granules before compression.

5.Lubricants:

These are added to improve the appearance of tablets, flow properties of granules and to prevent the sticking of the materials to the dies and punches. On the basis of their function, the lubricants are divided into three groups.

(i) Lubricants: These are the substances that reduce interparticular friction during compression and friction between tablet and die wall during the ejection of tablet e.g. talc, magnesium stearate and calcium stearate etc.

(ii) Glidants: They improve the flow properties of the granules from hopper to die of the tablet machine e.g. talc, sodium chloride, magnesium stearate, boric acid, starch and calcium stearate.

(iii) Anti-adhesive agents: These prevent the sticking of tablet surface to dies and punches during compression e.g. liquid paraffin. magnesium stearate and stearate acid etc.

6. Adsorbing agents:

These substances are used to adsorb volatile oil, liquid extract and tincture etc. which are included in the formulation of tablets. The commonly used adsorbents are magnesium carbonate, kaolin and starch.

7. Colours, flavours and sweetening agents:

Colours of approved, certified F.D. and C dyes are used. The colours are used improve the elegance of the tablet. The colours are added to the solution of the granulating agent or these are mixed with other ingredients before granulation.

Flavours are included in lozenges, effervescent tablets and chewable tablets. Flavours are volatile oils and hence they are added into the granules just before compression of tablets. Flavouring agent is dissolved in organic solvent and the solution is sprayed on the granules.

Sweetening agents are used to improve the taste of tablets. These are used in lozenges and chewable tablets. Artificial sweetening agents like saccharin and cyclamates, are not used nowadays. Sucrose, lactose and mannitol are some of the commonly used sweetening agents.[11]

METHOD OF PREPARATION

Step 1 : Weighing of Ingredients

All the ingredients were accurately weighed according to the formulation.

Equipment Used: Electronic weighing balance

Step 2 : Sieving

All powdered ingredients were passed through a suitable sieve to obtain uniform particle size and remove lumps.

The following ingredients were sieved:

1. Avipattikar Churna
2. Fennel Powder
3. Microcrystalline Cellulose
4. Starch Powder

Equipment Used: Sieve

Step 3 : Dry Mixing

The sieved ingredients were transferred into a clean mortar or blender and mixed thoroughly to obtain a uniform powder blend.

Mixing sequence:

1. Avipattikar Churna
2. Sugarcane Extract

3. Fennel Powder
4. Microcrystalline Cellulose
5. Starch Powder
6. Ascorbic Acid
7. Methyl Paraben

The mixture was blended for about 10–15 minutes.
Equipment Used: Mortar and pestle / blender

Step 4 : Preparation of Binder
A starch paste was prepared to be used as a binder.
Procedure:
1. Starch powder was dispersed in a small quantity of water.
2. The dispersion was heated gently with continuous stirring until a smooth paste was formed.

Equipment Used:
1. Beaker
2. Stirring rod
3. Hot plate

Step 5 : Wet Granulation
The prepared starch paste was added slowly to the powder mixture with continuous mixing to form a damp mass suitable for granulation.
Care was taken to avoid overwetting.
Equipment Used: Mortar and pestle / blender

Step 6 : Formation of Granules
The wet mass was passed through a sieve to prepare wet granules of uniform size.
Equipment Used: Sieve

Step 7 : Drying
The prepared granules were dried at room temperature or in a tray dryer until the required dryness was achieved.
Excess moisture was completely removed.
Equipment Used: Tray dryer / drying tray

Step 8 : Lubrication
The dried granules were mixed with:
1. Talc
2. Magnesium Stearate

This step improved the flow properties and prevented sticking during compression.
Equipment Used: Mortar and pestle / blender

Step 9 : Compression of Tablets
The lubricated granules were compressed into chewable tablets using a tablet punching machine.
The tablets were prepared with suitable hardness for easy chewing.
Equipment Used: Tablet punching machine

Step 10 : Packaging and Storage
The prepared herbal chewable tablets were packed in airtight containers and stored in a cool and dry place away from moisture.

Equipment Used: Airtight container

RESULT
Batches from F1 to F5

Ingredients	**F1**	**F2**	**F3**	**F4**	**F5**
Avipattikar churna	500	500	500	500	500
Sugarcane powder	150	130	120	100	80
Fennel powder	100	100	100	100	100
Micro crystalline cellulose	590	609	622	635	654
Starch powder	80	90	100	100	110
Starch paste	q.s.	q.s.	q.s.	q.s.	q.s.
Talc	20	20	20	20	20
Magnessium stearate	10	10	10	10	10
Ascorbic acid	5	5	5	5	5
Methyl paraben	2	2	2	2	2
Total weight. (gm)	**1.50 gm**	**1.50 gm**	**1.50 gm**	**1.50 gm**	**1.50 gm**

Best optimized batch – F4
Evaluation of F4 batch of avipattikar churna tablet
EVALUATION TEST :-
1. Appearance Test :
Apparatus : Visual inspection
Tablets were visually examined for color, shape, texture, cracks, and surface smoothness.
Observation : Brown, Smooth Tablet

2. Weight Variation Test
Apparatus : Electronic weighing balance
20 tablets were weighed individually and average weight was calculated. Individual weights were compared with average weight.
Observation : Average weight of tablets was found within acceptable pharmacopoeial limits.

3. Hardness Test :
Apparatus : Monsanto hardness tester / Pfizer hardness tester
Random tablets were tested for hardness by applying pressure until the tablet broke.
Observation : Hardness of tablets was found to be 5.2 kg/cm².

4. Thickness Test :
Apparatus : Vernier calliper
Thickness of tablets was measured individually.
Observation : Thickness of tablets was found uniform.

5. Friability Test :
Apparatus : Roche friabilator
Pre-weighed tablets were rotated at 25 rpm for 4 minutes and reweighed after dust removal.
Formula :

Friability (%) = W1-W2 * 100/W1
Where :

- W1 = Initial weight of tablets before test.
- W2 = Final weight of tablets after test.

Example : W1 = 15g, W2 = 14.92g

Friability = 15-14.92*100/15 = 0.53%
Observation : Friability was found to be less than 1%.

6. Disintegration Test :
Apparatus : Disintegration test apparatus
Tablets were placed in the apparatus containing suitable medium (0.1 N HCL) and time required for disintegration was recorded.
Observation : Tablets disintegrated within the acceptable time limit. (18 min)

7. Moisture Content :
Apparatus : Moisture balance / hot air oven
Moisture content of granules or tablets was determined by drying method.
Observation : Moisture content was found within acceptable range. (3.2%)

8. Organoleptic Evaluation :
Apparatus : Sensory evaluation
Tablets were evaluated for taste, odor, mouthfeel, and chewability.
Observation : Tablets showed pleasant taste, acceptable odor, and good chewability.

9. Stability Test :
Apparatus : Stability chamber
Tablets were stored under different temperature and humidity conditions and evaluated periodically.
Observation : No significant change in color, hardness, or appearance was observed during storage.

10. Dissolution Test :
Apparatus : USP Dissolution apparatus
The tablet was placed in dissolution medium maintained at 37 ± 0.5°C and samples were withdrawn at regular intervals to determine drug release.
Observation : Tablets showed satisfactory release of active constituents within the specified dissolution time.

11. Content Uniformity Test :
Apparatus : UV Spectrophotometer / Analytical balance
Individual tablets were analyzed for uniform distribution of active constituents. The amount of drug present in each tablet was determined and compared.
Observation : Active constituents were uniformly distributed in all tablets.

CONCLUSION :-
Avipattikar Churna illustrates the successful integration of classical Ayurvedic wisdom with modern scientific validation. By targeting both the underlying pathophysiology and the symptomatic manifestations of hyperacidity, the formulation offers a holistic and sustainable approach to gastrointestinal health. Its gastroprotective, antioxidant, and anti-inflammatory properties, along with its

ability to restore digestive balance, make it a promising natural therapy for long-term management of acid-peptic disorders. Continued research, standardization, and clinical evaluation will further strengthen its position as an effective and evidence-based herbal intervention suitable for incorporation into modern healthcare systems.

DISCUSSION :-

The rising incidence of hyperacidity and associated gastric disturbances in today's fast-paced lifestyle underscores the need for safe, long-term therapeutic solutions. While conventional allopathic drugs such as proton pump inhibitors and antacids offer quick symptomatic relief, they often do not address the root causes of the disorder and may lead to adverse effects with prolonged use. As a result, global research attention has increasingly shifted toward traditional systems of medicine like Ayurveda, which emphasize restoring digestive balance and metabolic harmony rather than merely suppressing symptoms.

Among the classical Ayurvedic preparations, Avipattikar Churna has gained prominence as a promising natural therapy for hyperacidity. This polyherbal formulation is composed of herbs known for their synergistic actions on digestive health. Amalaki acts as a potent antioxidant and mucosal protector; Haritaki and Bibhitaki contribute to detoxification and bowel regulation; Pippali and Sunthi enhance digestive enzyme secretion and nutrient assimilation; while Fennel provides carminative and soothing effects on the gastrointestinal tract. Collectively, these ingredients help regulate gastric acid secretion, strengthen the mucosal barrier, and improve overall digestive functioning.

Modern pharmacological studies support these traditional claims, demonstrating that Avipattikar Churna exhibits antiulcer, anti-inflammatory, antioxidant, and hepatoprotective activities. These therapeutic effects stem largely from bioactive constituents such as vitamin C, tannins, flavonoids, phenolic acids, and alkaloids, which counteract oxidative stress and acid-induced mucosal injury. Research also indicates that the formulation reduces excessive acid secretion, enhances mucus production, and fortifies enzymatic defenses, thus offering both protective and curative benefits to the gastric mucosa.

From the Ayurvedic perspective, Avipattikar Churna works by pacifying aggravated Pitta dosha and improving Agni (digestive fire) without causing dryness or irritation. Its action aligns with the principle of Samprapti Vighatana, wherein the pathological process is interrupted by neutralizing causative factors. This dual mechanism helps restore physiological balance and reduces the recurrence of hyperacidic episodes.

Clinically, Avipattikar Churna has shown significant improvement in symptoms such as heartburn, nausea, sour belching, and epigastric discomfort. Its high safety margin and tolerability even with prolonged usage make it a suitable natural alternative or complementary therapy for acid-peptic disorders. Nonetheless, further research is needed to ensure therapeutic consistency, standardize the formulation, profile its active phytoconstituents, and understand its molecular mechanisms using advanced pharmacological tools.

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