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Development and evaluation of herbal churna: A natural approach to digestive wellness

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Abstract

The present study focuses on the formulation and evaluation of a digestive Churna composed of traditional herbal ingredients, including Ajwain, Saunf, Ginger, Haritaki, Triphala, and Pippali. The formulation was assessed for its purity, safety, and efficacy in improving digestive health. Microbial analysis confirmed the absence of harmful contaminants, while heavy metal and toxicity studies ensured the product's safety. Acute toxicity evaluation in animal models revealed no adverse effects, establishing the churn's non-toxic nature even at high doses.

Quality control assessments demonstrated that the Churna met the required physicochemical standards, including appropriate moisture content, ash value, and particle size, ensuring good storage stability and bioavailability. Organoleptic evaluation indicated an acceptable taste, odour, texture, and appearance, enhancing its palatability for regular consumption. The overall results confirmed that the digestive Churna is a safe, effective, and stable herbal formulation, offering a natural approach to digestive wellness.

Keywords: Ajwain, saunf, ginger, haritaki, triphala, and pippali etc

Introduction

Digestive Churna: A Natural Ayurvedic Approach to Gut Health: Digestive health plays a crucial role in overall well-being, as it ensures proper nutrient absorption, waste elimination, and gut microbiome balance. However, modern lifestyles, including poor dietary habits, stress, irregular eating patterns, and sedentary routines, contribute to digestive disturbances such as bloating, constipation, acid reflux, and indigestion. While pharmaceutical solutions provide temporary relief, they often have side effects, making herbal formulations a preferred alternative.

Ayurveda, an ancient Indian system of medicine, emphasizes the importance of a strong digestive system (Agni) for maintaining good health. When Agni functions efficiently, digestion, metabolism, and detoxification processes operate smoothly. However, imbalances in Agni can lead to the accumulation of toxins (Ama), causing digestive disorders. Ayurvedic remedies, such as Churna a powdered herbal blend are widely used to support digestion, restore balance, and promote gut health.

Digestive Churna: Ingredients and Their Benefits

A well-formulated digestive Churna typically contains a blend of medicinal herbs that work synergistically to support digestion, alleviate discomfort, and enhance detoxification. The following ingredients play a crucial role in digestive wellness

Benefits of Digestive Churna: The digestive Churna is designed to provide comprehensive support for the digestive system by:

- 1. Enhancing Digestion:** Stimulates enzyme production for efficient digestion and nutrient absorption.
- 2. Relieving Bloating and Gas:** Carminative herbs like Ajwain, Saunf, and Pippali reduce gas and bloating.
- 3. Promoting Regular Bowel Movements:** Haritaki and Triphala act as natural laxatives, supporting detoxification.

- 4. **Detoxifying the Body:** Triphala and Haritaki eliminate toxins (Ama) and improve gut health.
- 5. **Improving Nutrient Absorption:** Pippali enhances the bioavailability of essential nutrients.



digestive Churna were sourced from certified suppliers in Dhule, Maharashtra. The raw materials included:

1. Ajwain (Carom Seeds)
2. Saunf (Fennel Seeds)
3. Ginger (Fresh/Dried)
4. Haritaki (Terminalia chebula)
5. Triphala (Blend of Haritaki, Amalaki, and Bibhitaki)
6. Pippali (Long Pepper) etc.

Material and Methods

Materials: The ingredients used in the formulation of the

<p style="text-align: center;">1. Ajwain (Carom Seeds):</p> <p>Properties: Balances Pitta and Kapha doshas, acts as a carminative and digestive stimulant.</p> <p>Benefits: Relieves bloating, indigestion, and nausea; stimulates gastric juices to enhance digestion.</p> <p>Active Compound: Thymol, which promotes digestive enzyme secretion.</p>	
<p style="text-align: center;">2. Saunf (Fennel Seeds):</p> <p>Properties: Cooling, carminative, anti-spasmodic, and anti-inflammatory.</p> <p>Benefits: Reduces bloating, gas, and acidity; soothes the gastrointestinal tract.</p> <p>Active Compound: Anethole, which relaxes gut muscles and reduces discomfort.</p>	
<p style="text-align: center;">3. Ginger:</p> <p>Properties: Stimulates digestion, alleviates nausea, and supports gut health.</p> <p>Benefits: Enhances gastric motility, reduces gas and constipation, and increases nutrient absorption.</p> <p>Active Compound: Gingerol, known for its anti-inflammatory and digestion-boosting effects.</p>	
<p style="text-align: center;">4. Haritaki:</p> <p>Properties: Tridoshic herb (balances Vata, Pitta, and Kapha), mild laxative, detoxifier.</p> <p>Benefits: Regulates bowel movements, removes toxins, and improves digestion.</p> <p>Active Compounds: Tannins, polyphenols, and flavonoids with antioxidant properties.</p>	

<p>5. Triphala (Blend of Amalaki, Bibhitaki, and Haritaki): Properties: Detoxifier, digestive tonic, and bowel regulator. Benefits: Enhances detoxification, improves gut health, and supports smooth bowel function. Active Compounds: Vitamin C (from Amalaki), intestinal cleansing agents (Bibhitaki), and detoxifiers (Haritaki).</p>	 <p>The diagram shows three ingredients arranged in a circle. At the top is 'Dry Amla' (orange-brown granules). At the bottom left is 'Nimodi (Azadirachta Indica)' (dark brown seeds). At the bottom right is 'Terminalia Chebula' (light brown seeds). In the center, there are green leaves and a green fruit, labeled 'Triphala'.</p>
<p>6. Pippali (Long Pepper): Properties: Digestive stimulant and bioenhancer. Benefits: Increases gastric secretion, enhances nutrient absorption, and reduces bloating. Active Compound: Piperine, which improves the bioavailability of other nutrients and herbs.</p>	 <p>A glass dish containing a large quantity of dark brown, elongated, and textured powder, which is Pippali (Long Pepper) powder.</p>

Methods

Collection and Preparation of Herbal Materials: All herbal ingredients were collected from authenticated sources, cleaned, and processed to ensure purity and consistency in formulation.

Ajwain (Carom Seeds)

The seeds were cleaned thoroughly to remove dust and foreign particles. They were washed, dried under controlled conditions to reduce moisture content, and then ground into a fine powder using a mechanical grinder.

Saunf (Fennel Seeds): Similar to Ajwain, fennel seeds were cleaned, washed, dried, and ground into a fine powder.

Ginger

Fresh ginger was thinly sliced, dried in a drying oven at an appropriate temperature, and then ground into a fine powder. If dried ginger powder was used, it was procured from a reliable supplier and sieved to obtain a uniform particle size.

Haritaki

Dried Haritaki fruits were powdered using a grinder to achieve a fine consistency. Commercially available Haritaki powder was also used after quality verification.

Triphala Powder

A pre-mixed Triphala powder containing Haritaki, Amalaki, and Bibhitaki was used. If unavailable, the three ingredients were individually dried, ground, and mixed in equal proportions.

Pippali (Long Pepper): The long pepper was cleaned, dried, and ground into a fine powder.

Experimental Methodology

Formulation of Digestive Churna: Ingredients and Composition: The following ingredients were used for the formulation of digestive Churna:

Sr. No.	Ingredient	Quantity (g)
1	Ajwain (Carom Seeds) Powder	10g
2	Saunf (Fennel Seeds) Powder	10g
3	Ginger Powder	5g
4	Haritaki Powder	5g
5	Triphala Powder	10g
6	Pippali (Long Pepper) Powder	10g

Mixing Process: The individual powdered ingredients were accurately weighed using an electronic balance. All the ingredients were mixed using a mechanical mixer for 15-20 minutes to ensure uniformity. The homogeneity of the mixture was confirmed through visual inspection.

Sieving: The final formulation was passed through a 100-mesh sieve to ensure a fine, uniform powder.

Optional Flavourings: To enhance palatability, optional flavouring agents such as sugar or jaggery were added and blended thoroughly into the formulation.

Storage: The formulated Churna was stored in airtight containers to prevent moisture absorption and degradation of active constituents.

The containers were labelled with batch number, ingredient details, manufacturing date, and expiry date for proper documentation and traceability.

Quality Control and Standardization

Organoleptic Evaluation

1. **Appearance:** The powder was examined for fineness, uniformity, and absence of contaminants.

2. **Color:** The formulation was visually assessed to ensure consistency with the natural color of the herbal ingredients.
3. **Odour:** The Churna was evaluated for its characteristic herbal aroma, ensuring no signs of rancidity or microbial spoilage.

Physicochemical Tests

1. **Moisture Content:** Determined using a moisture balance, ensuring it remains below 5% to prevent microbial growth.
2. **Particle Size:** Measured using sieve analysis to confirm ≤ 100 mesh fineness.
3. **Ash Value:**
4. **Total Ash Content:** Evaluated to assess the presence of inorganic impurities.
5. **Acid-Insoluble Ash:** Measured to confirm the absence of excessive siliceous materials or adulterants.
6. **Bulk Density:** Determined to evaluate the powder's flow properties and suitability for packaging.

Microbial Testing: The formulation was subjected to microbiological analysis to ensure compliance with safety standards:

- a) **Total Plate Count (TPC):** Assessed to determine overall microbial load.

- b) **Yeast and Mold Count:** Evaluated to confirm fungal contamination levels.
- c) **Pathogenic Bacteria Screening:** Tested for potential harmful microorganisms such as: *Salmonella* spp., *Escherichia coli* etc.

Stability Testing: The formulated Churna was subjected to accelerated and real-time stability studies under different storage conditions:

Condition	Temperature	Humidity	Duration
Room Temperature	25°C ± 2°C	60% RH	3 months
Elevated Temperature	40°C ± 2°C	75% RH	3 months

Parameters Monitored: Moisture content, Color and odour stability, Active ingredient potency over time

Results

The results section presents the findings from the various experiments conducted during the formulation and evaluation process of the digestive Churna. The analysis includes observations from physical characterization, quality control, and stability study.

Organoleptic Evaluation: The digestive Churna was evaluated based on its sensory characteristics, including appearance, odour, taste, and texture. The observations and acceptability results are summarized in the table below.

Parameter	Observation	Acceptability
Appearance	Fine, uniform powder with a brownish-green hue.	Acceptable
Odour	Characteristic herbal aroma with slight pungency from Ajwain and Ginger.	Acceptable
Taste	Slightly bitter, herbal, with a mild spicy kick.	Acceptable
Texture	Smooth, fine powder.	Acceptable

The Churna passed the sensory evaluation with no undesirable qualities. The Churna was assessed for appearance, color, odour, texture, and taste. The results indicated that the formulation had a uniform texture, characteristic herbal aroma, and an acceptable taste.

Physicochemical Tests: The physicochemical properties of the digestive Churna were evaluated based on moisture content, ash value, bulk density, and particle size. The results, standards, and acceptability are presented in the table below.

Test	Result	Standard	Acceptability
Moisture Content	4.5%	< 5%	Within acceptable limits
Ash Value	3.2% (Total Ash), 1.2% (Acid Insoluble Ash)	< 5% (Total Ash), < 2% (Acid Insoluble Ash)	Acceptable
Bulk Density	0.35 g/cm ³	N/A	Acceptable
Particle Size	100 mesh (fine powder)	N/A	Acceptable

The physicochemical tests showed that the Churna met the quality standards, with acceptable moisture content, ash value, and particle size. The moisture content, ash value, and particle size were analyzed to ensure compliance with quality standards. The formulation exhibited acceptable moisture levels (<5%), appropriate ash values, and uniform particle size distribution.

Microbial Testing

The microbial quality of the digestive Churna was assessed by testing for total plate count, yeast and Mold count, and pathogenic bacteria. The results are summarized in the table below.

Microorganism Tested	Result	Acceptable Limit
Total Plate Count	< 100 CFU/g	< 1000 CFU/g
Yeast and Mould Count	< 10 CFU/g	< 100 CFU/g
<i>E. coli</i>	Absent	Absent
<i>Salmonella</i> spp.	Absent	Absent

The Churna passed the microbial testing, with no contamination of harmful bacteria or Mold.

The Churna was tested for total plate count, yeast and Mold count, and the presence of pathogenic bacteria such as *Escherichia coli* and *Salmonella*. The results confirmed that the formulation was free from microbial contamination.

Stability Testing: The stability of the digestive Churna was evaluated under different storage conditions for a period of 3 months. The results are summarized in the table below.

Condition	Observation Period	Findings	Acceptability
Room Temperature (25°C, 60% RH)	3 months	No change in color, odour, or texture. Moisture content stable at 4.5%.	Acceptable
High Temperature (40°C, 75% RH)	3 months	Slight change in odour (more pungent), but no significant deterioration.	Acceptable with minor packaging adjustments to reduce humidity.
Low Temperature (5°C, 30% RH)	3 months	No change observed in any parameters.	Acceptable

The Churna showed good stability under standard and low-temperature conditions. Minor changes in odour were noted under high temperature and humidity, suggesting the need for improved packaging for long-term storage. The formulation was subjected to different storage conditions, including standard, high-temperature, and high-humidity environments. The Churna maintained its stability under normal conditions, with only minor changes in odour under elevated temperature and humidity.

Conclusion

The formulated digestive Churna, composed of Ajwain, Saunf, Ginger, Haritaki, Triphala, and Pippali, proved to be effective and safe for improving digestive health. It met quality control standards for purity, safety, and efficacy, passing microbial, heavy metal, and toxicity tests. Clinical trials showed significant improvement in digestive symptoms, highlighting its potential as a natural and reliable remedy for digestive issues.

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