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Research Article

Formulation & Evaluation of Polyherbal Papaya Churna for Supportive Management of Dengue

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ABSTRACT

Papaya churna is a polyherbal formulation prepared using natural ingredients known for their digestive, antioxidant, and therapeutic properties. The present study aimed to formulate and evaluate a herbal papaya churna containing papaya leaf powder, papaya fruit powder, black salt, sugar powder, isabgol, triphala, cumin seed powder, and dry ginger powder. The formulation was developed using suitable proportions of powdered ingredients and evaluated for its physicochemical and organoleptic characteristics. Papaya leaf and fruit powders were incorporated due to their rich content of enzymes, vitamins, and antioxidants that support digestion and overall health. Triphala, cumin seed powder, and dry ginger powder were added for their carminative, digestive, and anti-inflammatory activities, while black salt enhances palatability and digestive action. Isabgol acts as a natural laxative and improves bowel movement. Sugar powder was included to improve taste and patient acceptability. The prepared churna was evaluated for parameters such as color, odor, taste, particle size, bulk density, angle of repose, moisture content, ash value, and pH. The formulation showed satisfactory flow properties, acceptable physicochemical characteristics, and good stability. The study concludes that the prepared papaya churna may serve as an effective herbal digestive formulation with potential benefits in improving gastrointestinal health and relieving constipation and indigestion. Further pharmacological and clinical studies are required to confirm its therapeutic efficacy and safety.

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INTRODUCTION

Herbal medicine has been used since ancient times for the prevention and treatment of various diseases due to its natural origin, safety, and therapeutic benefits. Dengue is a mosquito-borne viral disease that causes high fever, weakness, body pain, and reduction in platelet count. In recent years, herbal remedies have gained attention as supportive therapy in dengue management. [1] Carica papaya is one of the important medicinal plants used in traditional medicine. Papaya leaves are rich in bioactive compounds such as papain, flavonoids, and antioxidants, which may help improve platelet count and strengthen immunity during dengue infection. [3] Churna is a traditional Ayurvedic powdered formulation that offers advantages such as easy preparation, better absorption, convenient administration, and longer shelf life. Papaya churna prepared using papaya leaf powder and other herbal ingredients may provide supportive health benefits in dengue management and improve overall digestive and immune health. [4]

Pharmacological Activities

1. Platelet Count Enhancing Activity

Papaya leaves are known to help increase platelet count in dengue patients. They stimulate bone marrow activity and support thrombopoiesis (platelet production).

2. Immunomodulatory Activity

The phytoconstituents present in papaya and other herbal ingredients help strengthen the immune system. They enhance the body's defense mechanism against viral infections.

3. Antioxidant Activity

Flavonoids, phenolic compounds, and vitamin C present in the formulation neutralize free radicals. They reduce oxidative stress caused during dengue infection.

4. Anti-inflammatory Activity

Herbal constituents help reduce inflammation and associated symptoms such as fever, body pain, and joint pain.

5. Antiviral Activity

Certain bioactive compounds of papaya leaves have shown inhibitory effects against dengue virus replication in experimental studies.

6. Hepatoprotective Activity

The formulation helps protect liver cells from damage caused by viral infection and oxidative stress.

7. Digestive and Carminative Activity

Ingredients such as cumin, dry ginger, and black salt improve digestion, reduce bloating, and enhance appetite during illness.

8. Hematopoietic Activity

Supports the formation of blood cells and helps in recovery from thrombocytopenia associated with dengue fever.

9. Adaptogenic and General Tonic Effect

The polyherbal formulation improves overall health, reduces weakness, and promotes faster recovery. [3,4,5,6]

Aim

To prepare and evaluate a herbal papaya churna containing papaya leaf powder and other herbal ingredients for supportive management of dengue and improvement of overall health.

Objectives

- To formulate papaya churna using papaya leaf powder, papaya fruit powder, triphala, isabgol, cumin seed powder, dry ginger powder, black salt, and sugar powder.
- To study the importance of papaya as a herbal medicine in supportive dengue care.
- To evaluate the physicochemical properties of the prepared churna such as color, odor, taste, pH, moisture content, and ash value.
- To assess the flow properties of papaya churna by determining bulk density, tapped density, and angle of repose.
- To develop a natural and easy-to-administer herbal formulation with potential digestive, antioxidant, and immune-supporting benefits.
- To promote the use of herbal churna as a traditional and economical dosage form for health management. [10]

Literature Review

1. Introduction to Papaya

Carica papaya, commonly known as papaya, belongs to the family Caricaceae. It is a tropical medicinal plant widely cultivated in India and other tropical countries. Different parts of the plant including leaves, fruits, seeds, and roots possess significant therapeutic properties. Papaya leaves have gained considerable attention due to their potential role in improving platelet count during dengue fever. The plant contains various bioactive compounds such as alkaloids, flavonoids, phenolic compounds, and enzymes that contribute to its medicinal value. Papaya is rich in vitamins A, C, and E, minerals, antioxidants, and digestive enzymes. Due to its nutritional and medicinal benefits, papaya has been extensively used in traditional and modern healthcare systems.

2. Traditional Uses of Papaya

Papaya has been traditionally used in Ayurveda and folk medicine for the management of various diseases. The leaves are commonly utilized for treating fever, digestive disorders, malaria, and viral infections. Papaya fruit is known for its laxative and digestive properties due to the presence of papain enzyme.

Traditional medicinal uses of papaya include:

Management of fever and infections.

Improvement of digestion and appetite.

Relief from constipation.

Enhancement of immunity.

Anti-inflammatory activity.

Antioxidant protection.

Supportive treatment during dengue fever.

Promotion of wound healing and skin health.

3. Phytochemical Constituents of Papaya

Papaya contains numerous phytochemicals responsible for its pharmacological activities. Major constituents include:

I] Alkaloids (Carpaine)

II] Flavonoids

III] Saponins

IV] Tannins

V] Glycosides

VI] Phenolic compounds

VII] Papain and Chymopapain enzymes

VIII] Vitamin C

IX] Vitamin A

X] Lycopene

XI] Beta-carotene

These phytochemicals exhibit antioxidant, anti-inflammatory, antiviral, immunomodulatory, and hematopoietic activities which may contribute to supportive management of dengue. [11,12]

4. Review of Previous Research Studies

Several studies have investigated the medicinal properties of papaya and herbal formulations for dengue management. Studies on papaya leaf extract demonstrated a significant increase in platelet count among dengue patients. Researchers reported that papaya leaf preparations possess thrombopoietic activity which supports recovery from thrombocytopenia associated with dengue fever. Various herbal formulations containing papaya, giloy, tulsi, and other medicinal plants have shown promising results in enhancing immunity and improving hematological parameters. Research on polyherbal formulations suggests that combining multiple herbs can provide synergistic therapeutic effects due to the presence of diverse phytoconstituents. Such formulations may offer antioxidant, antiviral, immunostimulatory, and supportive benefits during dengue infection.

Previous studies also highlighted the importance of standardization and quality evaluation of herbal churna formulations to ensure efficacy, safety, and reproducibility. [19]

5. Role of Ingredients Used in Polyherbal Papaya Churna

I] Papaya Leaf Powder

Acts as the principal ingredient and is reported to support platelet production, improve immunity, and provide antioxidant activity.

II] Dry Ginger Powder (Zingiber officinale)

Improves digestion, reduces inflammation, and enhances bioavailability of herbal constituents.

III] Black Salt

Acts as a digestive agent and improves palatability of the formulation.

IV] Sugar Powder

Used as a sweetening agent to improve taste and patient acceptability.

6. Churna Dosage Form

Churna is a finely powdered Ayurvedic dosage form prepared from dried herbal ingredients. It is one of the oldest and most commonly used herbal formulations due to its simplicity and effectiveness.

Advantages of churna include:

Easy preparation.

Rapid absorption.

Improved bioavailability.

Better patient compliance.

Cost-effective formulation.

Suitable for combining multiple herbal ingredients. Proper sieving, mixing, and storage are essential to maintain uniformity and quality of churna formulations. [15]

7. Objectives Derived from Literature

Based on the literature reviewed, the present study was designed with the following objectives:

- To formulate a polyherbal papaya churna using medicinal herbs beneficial for supportive dengue management.
- To evaluate the organoleptic characteristics of the prepared formulation.
- To determine physicochemical parameters such as ash value, moisture content, pH, and extractive values.
- To assess flow properties including angle of repose, bulk density, tapped density, Carr's Index, and Hausner Ratio.
- To perform microbial limit testing for quality assurance.
- To establish standardization parameters for the developed formulation.
- To explore the potential supportive role of polyherbal papaya churna in improving health status during dengue fever. [21]

Ingredients Used and Their Roles

Ingrdients	Role in Papaya Churna
Carica papaya Leaf Powder	Helps support platelet count, boosts immunity, and provides antioxidant activity
Papaya Fruit Powder	Improves digestion and provides vitamins and nutrients
Triphala Powder	Acts as a digestive, detoxifying, and antioxidant agent
Isabgol	Functions as a natural laxative and improves bowel movement
Cumin Seed Powder	Enhances digestion and relieves gastric discomfort
Dry Ginger Powder	Provides anti-inflammatory and digestive properties
Black Salt	Improves taste and aids digestion
Sugar Powder	Enhances palatability and patient acceptability

I] Papaya leaf

Rank	Classification
Domain	Eukaryota
Kingdom	Plantae
Subkingdom	Tracheobionta
Phylum	Spermatophyta
Subphylum	Angiospermae
Infra phylum	Magnoliophyta
Class	Mangnoliopsida
Subclass	Dillniidae
Superoder	Violanae
Order	Brassicales

Family	Caricaceae
Subfamily	Caricoideae
Genus	Carica
Botanical name	Carica papaya Linn
Synonym	Papaya carica

Fig. 1: Papaya Leaf

Geographical Description

Papaya (Carica papaya L.) is believed to have originated in Central America and Southern Mexico. It is now widely cultivated in tropical and subtropical regions throughout the world. Major papaya-growing countries include India, Brazil, Mexico, Indonesia, and Thailand. In India, papaya is commonly cultivated in states such as Maharashtra, Gujarat, Andhra Pradesh, Karnataka, and Tamil Nadu. It grows best in warm climates with temperatures between 21–33°C, well-drained fertile soil, and moderate rainfall. [17]

Morphological Description of Papaya Leaf

Leaves are large, simple, and deeply palmately lobed. Arranged in a spiral pattern at the top of the stem. Leaf blade is 25–75 cm wide with 5–11 deep lobes. Petiole is long, hollow, and green, measuring 30–100 cm in length. Upper surface is dark green, while the lower surface is light green. Leaves contain milky latex, which exudes when cut. Diagnostic Character: Large palmately lobed leaves with a long hollow petiole and milky latex. [10]

Major Phytoconstituents of Papaya Leaf Powder:

Phytoconstituents	Activity/ Importance
Papain	Proteolytic Enzyme; aids digestion
Chymopapain	Anti-inflammatory enzyme
Alkaloids	Cardioprotective and antimicrobial activity
Flavonoids	Antioxidant activity
Tannins	Astringent and antimicrobial properties
Saponins	Immune-enhancing and antimicrobial activity
Glycosides	Therapeutic activity
Phenolic compounds	Antioxidant properties
Vitamins A, C, E	Immunity and antioxidant support
Minerals (Calcium, Magnesium, Potassium)	Nutritional support
Terpenoids	Anti-inflammatory activity

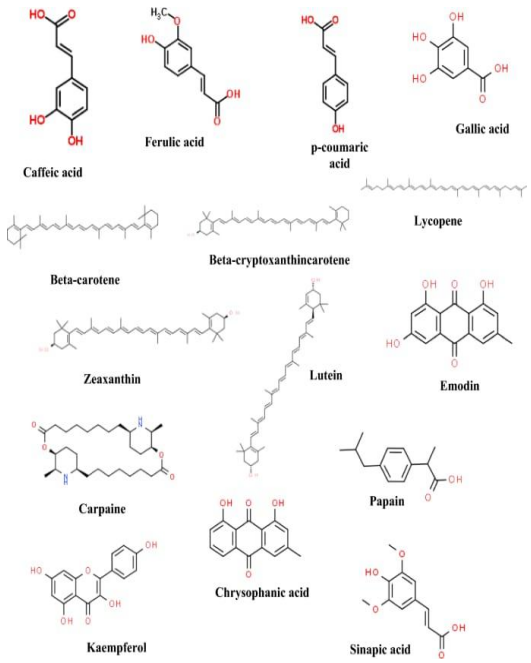

Fig. 2: Chemical Constituents

II] Papaya fruit powder

Rank	**Classification**
Domain	Eukaryota
Kingdom	Plantae
Sub kingdom	Tracheobionta
Phylum	Spermatophyta
Subphlyum	Angiospermae
Infraphylum	Magnoliophyta
Class	Magnoliopsida
Subclass	Dilleniidae
Suborder	Violance
Order	Brassicales
Family	Caricaceae
Subfamily	Caricoideae
Genus	Carica
Species	Carica papaya
Botanical name	Carica papaya L.
Synonym	Papaya carica

Fig.3: Papaya Fruit Powder

Part used

Ripe or unripe fruit

Major Phytoconstituents

I] Papain

II] Chymopapain

III] Carotenoids (β-carotene, lycopene)

IV] Flavonoids

V] Alkaloids

VI] Vitamin C

VII] Vitamin A

VIII] Pectin

IX] Phenolic compounds

III] Isabgol powder

Rank	**Classification**
Domain	Eukaryota
Kingdom	PAntae
Subkingdom	Traceobionta
Phylum	Spermatophyta
Subphylum	Angiospermae
Infraphylum	Magnoliophyta
Class	Magnoliopsida
subclass	Asteridae
Superorder	Lamianae
order	Lamiales
Family	Plantaginaceae
Subfamily	Plantaginoideae
Genus	Plantago
Species	Plantago ovata
Botanical name	Plantago ovata Forssk
Synonym	Plantago ispaghula Roxb

Fig. 4: Isabgol

Part Used

Seeds and seed husk

Major Phytoconstituents

I] Mucilage

II] Hemicellulose

III] Polysaccharides

IV] Fixed oils

V] Proteins

VI] Tannins

VII] Iridoid glycosides (Aucubin)

VIII] Minerals (Potassium, Calcium)

Uses

1] Natural bulk-forming laxative

2] Relieves constipation

3] Supports digestive health

Fig. 4: Isabgol

4] Use aceutical formulations such as churna, granules, and powders. [15]

IV] Triphala powder

Triphala is a polyherbal formulation consisting of three fruits: Amla, Haritaki, and Bibhitaki.

Ingredient	**Botanical Name**	**Family**
Amla	Phyllanthus emblica L. (Synonym: Emblica officinalis)	Phyllanthaceae
Haritaki	Terminalia chebula Retz.	Combretaceae
Bibhitaki	Terminalia bellirica (Gaertn.) Roxb.	Combretaceae

Fig. 5: Triphala Powder

Parts Used

Dried fruits of:

I] Amla

II] Haritaki

III] Bibhitaki

Major Phytoconstituents

I] Gallic acid

II] Ellagic acid

III] Chebulagic acid

IV] Chebulinic acid

V] Tannins

VI] Flavonoids

VII] Polyphenols

VIII] Vitamin C

Therapeutic Uses

1] Digestive tonic

2] Mild laxative

3] Antioxidant

4] Detoxifying agent

5] Immunity enhancer

6] Supports gastrointestinal health and overall wellness. [16]

V] Cumin seed powder

Rank	Classification
kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Apiales
Family	Apiaceae
Genus	Cuminum
Species	Cuminum cyminum
Botanical name	Cuminum cyminum L.

Fig. 6: Cumin seed powder

Common Names

Cumin

Jeera

Cumin Seeds Powder

Part Used

Dried ripe fruits

Major Phytoconstituents

I] Cuminaldehyde

II] Cymene

III] Terpenes

IV] Flavonoids

V] Tannins

VI] Phenolic compounds

Uses

1] Carminative and digestive aid

2] Antioxidant and antimicrobial activity

3] Used in churna, herbal formulations, and food preparations

4] Helps relieve indigestion, flatulence, and abdominal discomfort. [17]

VI] Dry ginger powder

Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Liliopsida
Order	Zingiberales
Family	Zingiberaceae
Genus	Zingiber
Species	Zingiber officinale
Botanical name	Zingiber officinale Roscoe

Fig. 7: Dry Ginger Powder

Common Names

Sonth (Hindi)

Sunthi (Ayurveda)

Part Used

Dried rhizome

Major Phytoconstituents

I] Gingerols

II] Shogaols

III] Zingerone

IV] Essential oils (Zingiberene, Bisabolene)

V] Resin

Uses

1] Digestive stimulant and Carminative

2] Anti-inflammatory and Antioxidant

3] Used in Ayurvedic churna and herbal formulations for indigestion, nausea, and common cold. [20]

VII] Black Salt

Black Salt (Kala Namak) is a mineral salt, not a plant. Therefore, it does not have a botanical taxonomy.

Parameter	Classification
Common name	Black salt
Type	Mineral salt
Source	Natural mineral deposites
Chemical nature	Sodium chloride with sulfur compounds
Appearance	Dark brown to black crystalline powder
Taste	Salty with characteristic sulfurous flavor
Odour	Sulfur like

Fig.8: Black Salt

Major Constituents

I] Sodium chloride (NaCl)

II] Sodium sulfate

III] Iron sulfide

IV] Hydrogen sulfide compounds

Pharmaceutical Uses

1] Digestive aid and Carminative

2] Relieves flatulence and indigestion

3] Improves taste and palatability of herbal preparations. [14]

VIII] Sugar powder

Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Liliopsida
Order	Poales
Family	Poaceae
Genus	Saccharum
Species	Saccharum officinarum
Botanical name	Saccharum officinarum L.

Common Names

Sugar Powder

Powdered Sugar

Part Used

Purified sugar obtained from sugarcane juice

Major Constituents

I] Sucrose (95–99%)

II] Glucose

III] Fructose

Uses

1] Sweetening agent in pharmaceutical formulations

2] Improves taste and palatability of churna and syrups

3] Used as a diluent and vehicle in herbal preparations

4] Provides quick source of energy. [17]

Collection and Preparation of Crude Drugs:

I]Papaya leaf powder

Papaya Leaves (Carica papaya)

↓

Collection of Leaves

↓

Authentication

↓

Washing (Removal of dust and dirt)

↓

Drying

(Shade drying at room temperature)

↓

Size Reduction

(Cutting into small pieces)

↓

Pulverization

(Grinding into powder)

Sieving

(Uniform particle size)

Papaya Leaf Powder

Storage in Airtigh Container

Formulation Procedure for 50 g Papaya Churna:

Ingredients and Quantity

Ingredients	Quantity
Carica papaya Leaf Powder	15 g
Papaya Fruit Powder	10 g
Triphala Powder	5 g
Isabgol	5 g
Cumin Seed Powder	5 g
Dry Ginger Powder	3 g
Black Salt	2 g
Sugar Powder	5 g
Total	50 g

Procedure:

1. All the ingredients were collected and weighed accurately according to the required quantity.

2. The crude drugs were cleaned properly to remove impurities and dried under shade when required.

3. Papaya leaves, papaya fruit, cumin seeds, triphala, and dry ginger were powdered separately using a grinder.

4. The powders were passed through a suitable sieve to obtain uniform particle size.

5. Accurately weighed quantities of all powdered ingredients were mixed thoroughly in a mortar and pestle to prepare a homogeneous churna.

6. Black salt and sugar powder were added to improve taste and palatability.

7. The prepared papaya churna was packed and stored in an airtight container for further evaluation and use. [23]

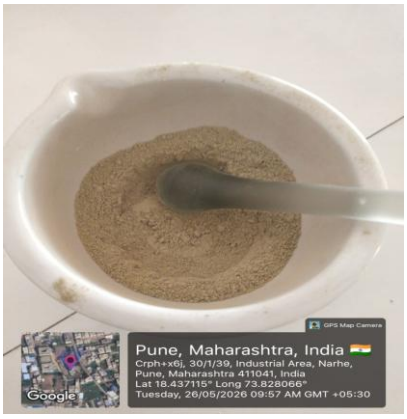

Fig. 9: Formulation of Churna

Evaluation Tests for Papaya Churna

1. Organoleptic Evaluation

The prepared churna was evaluated for:

- Color
- Odor
- Taste
- Appearance

2. Particle Size

The powder was passed through a suitable sieve to determine uniform particle size.

3. Bulk Density

Bulk density was determined by measuring the volume occupied by a known quantity of churna before tapping.

4. Tapped Density

Tapped density was measured after tapping the measuring cylinder until a constant volume was obtained.

5. Angle of Repose

Angle of repose was determined to evaluate the flow property of the churna powder.

6. Moisture Content

Moisture content was determined by drying the sample and calculating loss of moisture.

7. Ash Value

Ash value test was performed to determine the amount of inorganic matter present in the formulation.

8. pH Determination

The pH of the churna solution was measured using a pH meter.

9. Carr's Index

Carr's index was calculated to evaluate compressibility and flow characteristics of the powder.

10. Hausner Ratio

Hausner ratio was determined to study the flowability of the prepared churna. [9,15,19]

Evaluation Parameters with Procedure

1. Organoleptic Evaluation

Procedure:

The prepared papaya churna was examined visually and manually for its color, odor, taste, and appearance.

2. Particle Size Determination

Procedure:

The churna powder was passed through a suitable sieve and the particle size uniformity was observed.

Fig. 10: Size Determination

3. Bulk Density

Procedure:

A known quantity of churna was poured into a graduated measuring cylinder without tapping, and the volume occupied was noted.

Fig. 11: Bulk Density

Formula:

$$\text{Bulk Density} = \frac{\text{Mass of the powder}}{\text{Total volume it occupies}}$$

4. Tapped Density

Procedure:

The measuring cylinder containing the powder was tapped continuously until constant volume was obtained. The final volume was recorded.

Fig. 12: Tapped Density

Formula:

$$\text{Tapped Density} = \frac{\text{Mass of Powder}}{\text{Tapped Volume}}$$

5. Angle of Repose

Procedure:

The powder was allowed to flow through a funnel to form a cone on a flat surface. The height and radius of the cone were measured.

Fig. 13: Angle of repose

Formula:

$$\tan\theta = \frac{h}{r}$$

Where:

h = height of powder cone

r = radius of powder cone

6. Moisture Content

Procedure:

A weighed quantity of churna was dried in a hot air oven until constant weight was obtained. The loss in weight was calculated.

Fig. 14: Moisture content

Formula:

$$\text{Moisture Content } (\%) = \frac{\text{Initial Weight} - \text{Final Weight}}{\text{Initial Weight}} \times 100$$

7. Ash Value

Procedure:

A known quantity of churna was incinerated in a silica crucible at high temperature until carbon-free ash was obtained. The ash was weighed.

Fig. 15: Ash Value

Formula:

$$\text{Ash Value } (\%) = \frac{\text{Weight of Ash}}{\text{Weight of Sample}} \times 100$$

8. pH Determination

Procedure:

A small quantity of churna was dissolved in distilled water and the pH was measured using a pH meter.

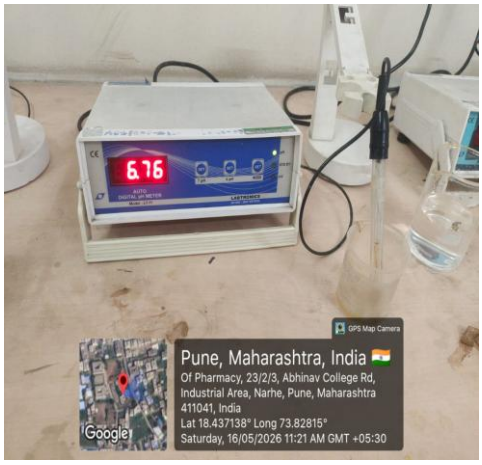

Fig. 16: pH Determination

9. Carr's Index

Procedure:

Carr's index was calculated using bulk density and tapped den $\text{Carr's Index } (\%) = \frac{\text{Tapped Density} - \text{Bulk Densit}}{\text{Tapped Density}}$

Formula:

10. Hausner Ratio

Procedure:

Hausner ratio was calculated using bulk density and tapped density.

Formula

$$\text{Hausner Ratio} = \frac{\text{Tapped Density}}{\text{Bulk Density}}$$

Observation Table:

Parameter	Observation
Color	Greenish brown
Odor	Characteristic
Taste	Slightly sweet, salty, and pungent
Particle Size	Uniform
Bulk Density	1.21g/ml
Tapped Density	2.31g/ml
Angle of Repose	37.95°
Moisture Content	6.5% w/w
Ash Value	10% w/w
pH	6.8
Carr's Index	47.61
Hausner Ratio	1.90

Microbial Limit Test for Herbal Churna

The Microbial Limit Test (MLT) for herbal churna is performed to determine the microbial contamination present in the herbal powder formulation and to ensure its safety and quality according to pharmacopeial standards. Herbal products are more prone to microbial contamination because they contain natural plant materials. [24]

Procedure

1] Weigh 1 g of herbal churna and transfer it into 9 mL sterile diluent.

2] Prepare serial dilutions (10^{-2}, 10^{-3}) using sterile diluent.

3] For Total Aerobic Microbial Count (TAMC), inoculate 1 mL of diluted sample into sterile Petri plates, add nutrient agar, and incubate at 30–35°C for 24–48 hours.

4] For Total Yeast and Mold Count (TYMC), inoculate the sample on Sabouraud Dextrose Agar and incubate at 20–25°C for 5–7 days.

5] Count the colonies and calculate CFU/g.

6] Test for specified pathogens (E. coli, Salmonella, S. aureus, P. aeruginosa) using selective media.

7] Compare the results with pharmacopeial limits and record the observations. [25]

Fig. 17: Microbial Limit test

Result of Microbial Limit Test for Herbal Churna

The prepared herbal churna showed microbial counts within the acceptable limits prescribed by the Indian Pharmacopoeia. No pathogenic microorganisms such as E. coli, Salmonella, Staphylococcus aureus, or Pseudomonas aeruginosa were detected.

Result:

Plant Material Processing and Extraction

The plant materials were successfully processed and standardized for churna preparation.

Formulation of Herbal Churna

A stable and uniform polyherbal papaya churna was successfully formulated**.** The prepared churn filled into container and stored at room temperature

Evaluation of Herbal Churna

The prepared churna exhibited acceptable physicochemical properties and good flow characteristics, indicating its suitability for oral administration.

Stability Studies

The formulated churna was stored at room temperature (25 ± 2°C) The formulated polyherbal papaya churna was subjected to stability studies by storing it at room temperature for a period of 3 months. The formulation was evaluated periodically for changes in color, odor, taste, pH, and moisture content. No significant changes were observed during the study period, indicating that the churna remained physically and chemically stable under normal storage conditions. This confirms the good stability and shelf-life potential of the formulation.

DISCUSSION

The prepared papaya churna showed satisfactory organoleptic characteristics with acceptable color, odor, and taste. Uniform particle size indicated proper mixing and sieving of ingredients. The bulk density, tapped density, Carr's index, Hausner ratio, and angle of repose suggested good flow properties of the powder formulation. Moisture content was within acceptable limits, indicating good stability and lower chances of microbial growth. Ash value confirmed the purity of the formulation and presence of inorganic constituents within limits. The pH was found near neutral, making the churna suitable for oral administration. Carica papaya leaf powder, the major ingredient, may help support platelet count and immunity during dengue conditions, while other herbal ingredients contribute digestive, antioxidant, and health-supporting benefits. Overall, the prepared papaya churna showed good quality and acceptable evaluation results.

CONCLUSION

The present study successfully formulated and evaluated papaya churna containing Carica papaya leaf powder, papaya fruit powder, triphala, isabgol, cumin seed powder, dry ginger powder, black salt, and sugar powder. The prepared formulation showed satisfactory physicochemical and organoleptic properties, indicating good quality, stability, and acceptability. The formulation may provide supportive benefits in dengue management by helping to improve immunity and platelet count due to the presence of papaya leaf powder. Other herbal ingredients contribute digestive, antioxidant, and health-promoting activities. The churna dosage form is economical, easy to prepare, convenient to administer, and suitable for herbal health management. Further pharmacological and clinical studies are required to confirm its therapeutic efficacy and safety.

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