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Research Article

FORMULATION AND EVALUATION OF HERBAL DIGESTIVE POWDER FROM DILL LEAVES

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*Herbal medicines have gained significant attention due to their safety, efficacy, and minimal side effects compared to synthetic drugs. The present study focuses on the formulation and evaluation of a herbal digestive powder using dill leaves (*Anethum graveolens* L.), a well-known medicinal plant with carminative and digestive properties. The formulation was prepared by incorporating dill leaves along with other traditional herbal ingredients such as fennel, ajwain, dry ginger, black pepper, and rock salt.*

The prepared formulations were evaluated for various physicochemical parameters including pH, bulk density, tapped density, angle of repose, Carr's index, Hausner's ratio, moisture content, and solubility. The results indicated that the formulations exhibited good flow properties, acceptable moisture content, and weakly acidic pH suitable for digestive applications.

The presence of bioactive phytoconstituents such as flavonoids, essential oils, and phenolic compounds contributes to improved digestion, reduced gastrointestinal discomfort, and enhanced gut health. The study concludes that the developed herbal digestive powder is a safe, cost-effective, and efficient natural alternative to synthetic digestive formulations.

Key Words :-Herbal digestive powder, Dill leaves, *Anethum graveolens*, Carminative, Digestive health, Phytoconstituents, Flow properties, Herbal formulation

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INTRODUCTION:

Digestion is a complex physiological process that involves the breakdown of food into simpler absorbable forms. Improper digestion leads to disorders such as indigestion, bloating, flatulence, and abdominal discomfort. (1)

Dill (*Anethum graveolens* L.), a member of the Apiaceae family, has been traditionally used for its digestive, carminative, antimicrobial, and anti-inflammatory properties. It contains bioactive compounds such as monoterpenes, flavonoids, tannins, and essential oils, which enhance digestive enzyme secretion and improve gastrointestinal motility. (2)

The presence of bioactive phytoconstituents such as flavonoids, essential oils, and phenolic compounds contributes to improved digestion, reduced gastrointestinal discomfort, and enhanced gut health. The study concludes that the developed herbal digestive powder is a safe, cost-effective, and efficient natural alternative to synthetic digestive formulations. (3)

Rationale for Dill Leaves Digestive Powder

Herbal formulations, particularly in powder form, are becoming increasingly popular due to their simplicity, stability, and ease of administration. Herbal powders require minimal processing compared to other dosage forms, which helps in preserving the natural phytoconstituents and therapeutic value of plant materials. They are cost-effective, convenient for daily use, and suitable for long-term administration without causing dependency. Additionally, they can be easily incorporated into regular dietary practices, making them highly beneficial for maintaining digestive health (4).

Role of Dill Leaves in Digestive Health

Anethum graveolens, commonly known as dill, is an aromatic herb widely used in culinary preparations and traditional medicine. It is frequently added to foods such as pickles, soups, and salads due to its distinctive flavor and aroma. Apart from its culinary applications, dill has been recognized for its therapeutic properties, especially in promoting digestive health.

Dill leaves contain various bioactive compounds such as essential oils, flavonoids, tannins, and minerals, which contribute to their medicinal properties. These constituents exhibit carminative, antispasmodic, and digestive stimulant activities. Scientific evidence suggests that dill helps in relieving bloating, improving gastrointestinal motility, and enhancing digestive enzyme secretion,

thereby supporting efficient digestion (5).

Historical and Traditional Significance of Dill Leaves in Digestion

Dill leaves have been used for thousands of years across various ancient civilizations including the Greeks, Romans, and Egyptians. These cultures recognized dill not only as a culinary herb but also as a medicinal plant used for treating digestive disorders such as flatulence, abdominal pain, indigestion, and stomach cramps.

In traditional European herbal medicine and Ayurvedic practices, dill has been recommended for calming the gastrointestinal tract. It was often prepared as herbal infusions or combined with other medicinal herbs to improve appetite and relieve colic in children. Its long-standing traditional use highlights its effectiveness and safety as a natural digestive remedy (6).

Overview of the Digestive System

The digestive system is a complex physiological and biochemical system responsible for breaking down food into simpler, absorbable substances. This process allows nutrients such as carbohydrates, proteins, fats, vitamins, and minerals to be absorbed into the bloodstream and utilized for energy production, growth, repair, and maintenance of body functions.

Digestion involves two major processes: mechanical digestion and chemical digestion. Mechanical digestion begins in the mouth through mastication, where food is physically broken down and mixed with saliva. Chemical digestion involves enzymes and digestive secretions that convert complex food molecules into simpler forms.

The digestive system includes the following organs: mouth, oesophagus, stomach, small intestine, and large intestine (7).

Stages of Digestion

1. **Ingestion:** Intake of food through the mouth.
2. **Digestion:** Breakdown of food by mechanical action and enzymes such as amylase and pepsin.
3. **Absorption:** Nutrients are absorbed mainly in the small intestine into the bloodstream.
4. **Assimilation:** Absorbed nutrients are utilized by body cells for energy and growth.
5. **Egestion:** Removal of undigested waste materials through the large intestine.

Digestive power refers to the efficiency of the digestive system in carrying out these processes effectively (7).

Advantages of Digestive Powder

1. **Enhanced Nutrient Absorption and Utilization:**
Efficient digestion ensures proper absorption of

- nutrients, preventing deficiencies and supporting overall health (8).
- 2. Improved Gastrointestinal Motility:** Digestive powders promote smooth movement of food through the digestive tract, reducing constipation, bloating, and indigestion (9).
 - 3. Reduction in Digestive Disorders:** Regular use helps prevent common gastrointestinal issues such as acidity, flatulence, and abdominal discomfort.
 - 4. Stimulation of Digestive Enzymes and Secretions:** These formulations enhance the secretion of digestive enzymes, bile, and gastric juices, which are essential for digestion (10).
 - 5. Better Appetite Regulation:** Improved digestion supports proper hunger signals and appetite control.
 - 6. Strengthening of Gut Health:** Digestive efficiency supports beneficial intestinal microflora, improving immunity and metabolism (11).
 - 7. Detoxification and Waste Elimination:** Proper digestion facilitates elimination of toxins and waste materials, maintaining internal balance (12).

❖ Table No.1: Material And Method

Sr. No.	Ingredients	Uses
1	Dill Leaves (<i>Anethum Graveolens</i> L)	Improves, Gut Enhancer, Antibacterials, Antioxidant, Mild Carminative And Antispasmodic Antibacterial Use As Multivitamins. (13)
2	Fennel Seeds (<i>Foeniculum Vulgare</i> Mill)	Relieves Gas And Abdominal Discomfort, Improves Appetite, Supports Smooth Digestion, Reduces Acidity. (14)
3	Ginger (<i>Zingiber Officinale</i> Roscoe)	Enhances Gastric Motility, Reduces Nausea, Improves Digestion, Anti-Inflammatory And Antioxidant Effects. (15)
4	Black Pepper (<i>Piper Nigrum</i> L)	Stimulates Secretion Of Digestive Juices, Reduces Indigestion. (16)
5	Rock Salt	Enhances Taste, Aids Digestion By Stimulating Digestive Secretions, Helps Maintain Electrolyte Balance. (17)
6	Ajwain Seeds (<i>Trachyspermum Ammi</i> L)	Strong Carminative, Relieves Gas And Stomach Cramps. (18)

1. Collection of plant material :-

Fresh leaves of *anethum graveolens* (dill leaves) were collected from the local market.

2. Cleaning of raw material :-

The collected dill leaves were thoroughly washed under running tap water to remove dirt, dust, and other foreign particles. Excess water was drained off and leaves were spread on clean trays.

3. Drying of dill leaves :-

The cleaned leaves were subjected to shade drying initially to preserve phytoconstituents. Further drying was carried out in a hot air oven at 40–50°C until constant weight was achieved.

4. Size reduction :-

The completely dried leaves were powdered using a mortar and pestle or grinder. The powdered material

was then passed through sieve no. 60 to obtain a fine and uniform particle size.

5. Preparation of other ingredients :-

Take other ingredients such as fennel seed, ajwain seed, dry ginger, black pepper, rock salt grained into powder from.

6. Formulation of herbal digestive powder :-

All ingredients were accurately weighed according to the required formulation ratio.

7. Packaging and storage :-

The prepared herbal powder was transferred into airtight containers or moisture-proof pouches to prevent exposure to air, and contamination. The formulation was stored at room temperature in a dry place (19).

Table No 2:Formulation Table of Digestive Powder

Sr. No.	Ingredients	B1	B2	B3	Uses
1	Dill leaves powder	10 mg	15 mg	12 mg	Improves, gut enhancer, antibacterials, antioxidant, mild carminative
2	Fennel powder	5 mg	3 mg	6 mg	Reduces acidity
3	Ajwain powder	4 mg	3.5 mg	2 mg	Strong carminative.
4	Dry ginger powder	3 mg	2.5 mg	2 mg	Anti-inflammatory, antioxidant
5	Rock salt	Qs to 4mg	Qs to 5mg	Qs to 3g	Enhances taste, helps maintain electrolyte balance
6	Black pepper powder	2.3 mg	1.5 mg	2 mg	Stimulates secretion of digestive juices, reduces indigestion.

❖ **EVALUATION TESTS**

- 1. Colour** – Checks the appearance of powder.
- 2. Odour** – Identifies characteristic smell of ingredients.
- 3. Taste** – Determines palatability of formulation.
- 4. Texture** – Checks smoothness and fineness of powder.
- 5. pH Test** – Measures acidity or alkalinity.
- 6. Angle of Repose** – Evaluates flow property of powder.
- 7. Bulk Density** – Measures powder volume before tapping.
- 8. Tapped Density** – Measures powder volume after tapping.
- 9. Carr's Index** – Indicates compressibility and flowability.
- 10. Hausner's Ratio** – Shows powder flow characteristics.
- 11. Solubility** – Checks dissolving property in solvents.
- 12. Moisture Content** – Measures water content for stability.

❖ **RESULT AND DISCUSSION:**➤ **RESULT****Table No 3: Evaluation of Preformulation Parameters of Digestive Powder Formulations**

Sr. No.	Parameter	F1 value	F2 value	F3 value	Interpretation
1	Ph	5.5	5.0	6.1	Suitable for use (weakly acidic)
2	Angle of repose	35.7	31°	35.8°	Good flow property
3	Bulk density	0.53 g/ml	0.63 g/ml	0.79 g/ml	Moderate
4	Tapped density	0.65 g/ml	0.75 g/ml	0.86 g/ml	Good particle rearrangement
5	Carr's index	18.7%	18.4%	20.9%	Fair to good flowability
6	Hausner's ratio	1.22	1.19	1.08	Fair to good flowability
7	Moisture content	1.76%	2.10%	3.00%	Acceptable (f3 slightly higher)

➤ **DISCUSSION**

The results obtained from the evaluation of the herbal digestive powder indicate that the formulation has desirable physicochemical and functional properties. The angle of repose values for all formulations suggested good flow characteristics, which is essential for handling,

packaging, and uniform dosing of the powder. Bulk density and tapped density values indicated moderate packing ability and good particle rearrangement upon tapping. The carr's index and hausner's ratio values confirmed fair to good flowability, suggesting that the powder is suitable for processing and storage. The ph values ranged

from 5.0 to 6.1, indicating a weakly acidic nature, which is compatible with gastrointestinal conditions and supports digestive activity. Moisture content was within acceptable limits, although formulation f3 showed slightly higher moisture, which may affect long-term stability if not properly stored.

❖ SUMMARY AND CONCLUSION AND EXPECTED OUTCOMES

➤ SUMMARY

The present study focused on the formulation and evaluation of a herbal digestive powder using dill leaves (*anethum graveolens*) along with other traditional carminative herbs such as fennel, ajwain, dry ginger, black pepper, and rock salt. The formulation was prepared using simple and cost-effective methods including drying, and mixing of herbal ingredients in different proportions (f1, f2, f3). The prepared formulations were evaluated for various physicochemical parameters such as pH, angle of repose, bulk density, tapped density, carr's index, hausner's ratio, moisture content, and solubility. The results indicated that all formulations exhibited acceptable characteristics in terms of flow properties, compressibility, and stability. The pH was found to be weakly acidic, suitable for digestive use. Moisture content was within acceptable limits, indicating good stability and shelf life. Overall, the study demonstrated that the herbal digestive powder formulated using dill leaves possesses suitable properties for use as a natural digestive aid.

➤ CONCLUSION:

The present study successfully formulated and evaluated a herbal digestive powder using dill leaves and other traditional medicinal herbs. The evaluation results confirmed that the prepared formulations possess acceptable physicochemical properties, good flow characteristics, and stability suitable for oral administration. The combination of dill leaves with other carminative agents enhances the therapeutic potential of the formulation by improving digestion, reducing gastrointestinal discomfort, and promoting gut health. The use of natural ingredients ensures safety, affordability, and suitability for long-term use. Therefore, the developed herbal digestive powder can be considered an effective and promising natural alternative to conventional synthetic digestive products, with potential applications in daily healthcare and herbal medicine.

➤ EXPECTED OUTCOMES:-

Provide effective relief from common digestive issues such as indigestion, bloating, flatulence, and abdominal discomfort. Improve appetite and enhance overall digestive efficiency. Exhibit good physicochemical stability with acceptable pH,

moisture content, and flow properties maintain uniformity and ease of handling due to good flowability and particle size distribution offer a safe, natural, and cost-effective alternative to synthetic digestive formulations be suitable for regular use without causing dependency or adverse side effects support overall gut health due to the presence of bioactive phytoconstituents

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