

Research - Formulation and Evaluation of Polyherbal Effervescent Powder for Weight Loss

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Abstract: Polyherbal effervescent powders are gaining popularity as a natural and palatable alternative to conventional tablets and capsules for weight management. This study presents a Polyherbal effervescent powder formulated using a blend of traditional Indian spices and herbs including Black pepper (*Piper nigrum*), Fenugreek (*Trigonella foenum-graecum*), Cinnamon (*Cinnamomum verum*), Cardamom (*Elettaria cardamomum*), Cumin (*Cuminum cyminum*), Ajwain (*Trachyspermum ammi*), and Clitoria ternatea (butterfly pea), combined with effervescent excipients citric acid and sodium bicarbonate, along with corn starch and orange peel powder. The total formulation weight per sachet is 5 g.

The powder was prepared by a dry blending method with separately dried effervescent agents to avoid premature reaction. Phytochemical investigation confirmed the presence of pipeline, galactomannan, cinnamaldehyde, eucalyptol, cumin aldehyde, thymol, and tern tins (anthocyanins), which collectively contribute to thermogenic, appetite-suppressing, lipase-inhibiting, and digestive metabolic properties relevant to weight loss.

Four formulation batches (F1–F4) were prepared with varying ingredient ratios. The optimized formulation (F4) was evaluated for organoleptic properties, bulk density, tapped density, angle of repose, Carr's index, Hausner's ratio, effervescence time, pH, moisture content, solubility, foaming characteristics, phytochemical screening, irritancy test, and stability study. F4 demonstrated a pleasant blue-violet effervescent solution with pH 5.5–6.0, complete dissolution within 3 minutes, moisture content of 1.2%, and satisfactory flow properties. Irritation test showed no irritation. The Polyherbal effervescent powder offers a promising, patient-friendly, and effective adjunct supplement for weight management..

Keywords: Polyherbal effervescent powder, Weight loss, Antiobesity, Black pepper, Fenugreek, Cinnamon, Cardamom, Cumin, Ajwain, Clitoria ternatea, Piperine, Effervescence, Sachet formulation

I. INTRODUCTION

Obesity is one of the most common metabolic disorders affecting people worldwide and has become a major public health concern in recent years. It is characterized by excessive accumulation of body fat due to imbalance between energy intake and energy expenditure. Sedentary lifestyle, unhealthy dietary habits, lack of physical activity, stress, and genetic factors are major contributors to obesity. According to the World Health Organization, obesity increases the risk of several chronic diseases such as diabetes mellitus, hypertension, cardiovascular disorders, osteoarthritis, and certain types of cancer. The increasing prevalence of obesity has created a demand for safe and effective weight management therapies.

Conventional anti-obesity drugs available in the market are often associated with adverse effects such as insomnia, nervousness, gastrointestinal disturbances, and dependency. Therefore, Polyherbalformulations have gained significant attention due to their natural origin, better patient compliance, fewer side effects, and therapeutic benefits. Medicinal plants have been used in traditional systems of medicine like Ayurveda for centuries in the management of obesity and



metabolic disorders. Polyherbal drugs containing bioactive phytoconstituents such as flavonoids, alkaloids, tannins, saponins, and phenolic compounds help in improving metabolism, reducing fat accumulation, suppressing appetite, and enhancing thermogenesis.



In the present study, a Polyherbal effervescent powder formulation was developed using selected medicinal plants such as Black Pepper (*Piper nigrum*), Fenugreek (*Trigonella foenum-graecum*), Cinnamon (*Cinnamomum zeylanicum*), Ginger (*Zingiber officinale*), and Clitoria ternatea. Black pepper contains piperine which enhances metabolism and bioavailability of nutrients. Fenugreek is rich in dietary fiber and helps in appetite suppression and lipid reduction. Cinnamon improves glucose metabolism and insulin sensitivity, while ginger possesses thermogenic and digestive properties that aid in weight reduction. Clitoria ternatea is known for its antioxidant and anti-diabetic activities which support metabolic health.

Effervescent drug delivery systems are widely used because they rapidly dissolve in water and produce carbon dioxide due to reaction between acid and bicarbonate components. Effervescent formulations provide advantages such as improved palatability, rapid absorption, easy administration, enhanced patient compliance, and faster onset of action. In this formulation, citric acid and sodium bicarbonate were used as effervescent agents to produce a pleasant sparkling solution.

The present research work aims to formulate and evaluate a polyherbal effervescent powder for weight loss using suitable Polyherbal ingredients and pharmaceutical excipients. The prepared formulation was evaluated for various preformulation and evaluation parameters including organoleptic properties, angle of repose, bulk density, tapped density, Carr's index, Hausner ratio, effervescence time, pH, moisture content, and stability studies. The study was carried out to develop a stable, effective, and patient-friendly Polyherbal formulation for obesity management with improved therapeutic potential and minimal side effects.

1. Obesity – Definition and Global Burden

Obesity is a condition characterized by excessive accumulation of body fat that may negatively affect health. According to the World Health Organization, obesity is defined as a Body Mass Index (BMI) of 30 kg/m² or higher, while overweight is defined as BMI between 25–29.9 kg/m². The prevalence of obesity has increased rapidly worldwide due to unhealthy diet, physical inactivity, stress, and sedentary lifestyle. Obesity is associated with several serious health



complications such as type 2 diabetes mellitus, hypertension, cardiovascular diseases, fatty liver disease, sleep apnea, and hormonal disorders. Therefore, effective and safe management of obesity has become an important healthcare need.

2. Limitations of Current Anti-Obesity Drugs

Several synthetic drugs are available for obesity treatment, such as orlistat, liraglutide, semaglutide, and phentermine. Although these medications help in weight reduction, they are associated with various adverse effects. Common side effects include nausea, vomiting, gastrointestinal irritation, headache, insomnia, and long-term metabolic complications. Due to these limitations, there is increasing interest in safer and natural alternatives for weight management.

3. Rationale for Polyherbal Approach

Polyherbal medicines have been used traditionally in Ayurveda and other systems of medicine for the management of obesity and metabolic disorders. Herbs such as black pepper, fenugreek, cinnamon, ginger, and Clitoria ternatea possess anti-obesity, antioxidant, digestive, and metabolism-enhancing properties. These herbs help in reducing fat accumulation, improving digestion, regulating blood glucose levels, and promoting thermogenesis. Polyherbal formulations provide synergistic therapeutic effects and are generally considered safer, cost-effective, and more acceptable to patients.

4. Rationale for Effervescent Powder Formulation

Effervescent powder is a dosage form that rapidly dissolves in water and releases carbon dioxide due to the reaction between citric acid and sodium bicarbonate. This formulation provides several advantages over conventional tablets and capsules. It improves taste and palatability, enhances dissolution and absorption of Polyherbal ingredients, and provides faster onset of action. Effervescent formulations are easy to administer and improve patient compliance, especially in individuals who have difficulty swallowing solid dosage forms. The pleasant sparkling solution also masks the bitter taste of Polyherbal powders and provides accurate dosing in sachet form.

• Classification of Weight Management Supplements

Weight management Polyherbal preparations are classified based on their predominant mechanism:

Class		Polyherbal Example
Thermogenic agents	Increase basal metabolic rate and body heat production	Black pepper (piperine), Cinnamon (cinnamaldehyde)
Appetite suppressants	Increase satiety, reduce food intake	Fenugreek (galactomannan)
Lipase inhibitors	Reduce dietary fat absorption	Ajwain (thymol), Fenugreek (saponins)
Glucose regulators	Reduce post-prandial glucose, improve insulin sensitivity	Cinnamon, Clitoria ternatea (ternatins)
Carminatives/Digestive stimulants	Improve digestive efficiency, reduce bloating	Cumin, Cardamom, Ajwain
Antioxidants / Anti-inflammatory	Reduce adipose inflammation	Clitoria ternatea, Cardamom

• Ideal Properties of Polyherbal Effervescent Powder

- Fine, uniform powder texture — easy to dissolve and apply
- Uniform particle size — ensures even distribution of Polyherbal ingredients
- Low moisture content — prevents premature effervescent reaction and caking (< 1.0% w/w)
- Good solubility — completely dissolves in 200 mL water within 3 minutes



- Stable — retains potency and effectiveness under recommended storage conditions
- pH balanced — slightly acidic (5.5–6.0) suitable for oral consumption
- Good blend uniformity — ensures consistent dose per sachet

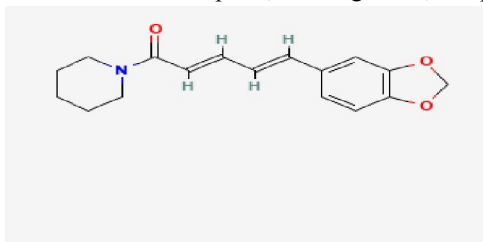
DRUG PROFILE

1. Black Pepper



Fig: – Black Pepper (*Piper nigrum*)

- Scientific Name: *Piper nigrum* L.
- Synonyms: Peppercorn, Kali Mirch, Marich
- Biological Source: Dried, unripe fruits of *Piper nigrum* L.
- Family: Piperaceae
- Chemical Constituents: Piperine (5–9%), chavicine, piperidine, essential oil (3–4%)
- Activity: Thermogenic, bioavailability enhancer (Bioperine), anti-adipogenic
- Uses: Digestive support, enhancement of nutrient absorption, thermogenesis, and prevention of cancer.



Chemical Structure: Piperine ($C_{17}H_{19}NO_3$)

2. Fenugreek (Methi)

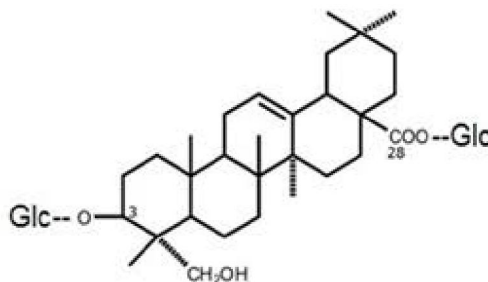


Fig: – Fenugreek / Methi (*Trigonella foenum-graecum*)

- Scientific Name: *Trigonella foenum-graecum* Linn.
- Synonyms: Methi, Chandrika, Egypt fenugreek, Fenogreco, Fenugrec



- Biological Source: Dried ripe seeds of *Trigonella foenum-graecum* Linn.
- Family: Fabaceae (Leguminosae)
- Chemical Constituents: Tryptophan, 4-hydroxyisoleucine, galactomannan (fiber), saponins, trigonelline
- Activity: Appetite suppressant, insulin sensitizer, pancreatic lipase inhibitor, scalp soothing
- Uses: Weight management, blood sugar control, galactagogue, and anti-inflammatory activity.



Chemical Structure: Saponins (steroidal glycosides)

3. Cinnamon



Fig – Cinnamon (*Cinnamomum verum*)

- Scientific Name: *Cinnamomum verum* J.Presl / *Cinnamomum zeylanicum* Blume
- Synonyms: Dalchini, True cinnamon, Ceylon cinnamon
- Biological Source: Dried inner bark of shoots of *Cinnamomum verum* trees
- Family: Lauraceae
- Chemical Constituents: Cinnamaldehyde (60–75%), eugenol, cinnamic acid, procyanidins (type-A)
- Activity: Thermogenic (TRPA1 activation), insulin sensitizer (PTP1B inhibition), blood glucose reducer
- Uses: Obesity management, antidiabetic, antimicrobial, antifungal, and cardioprotective activities.

4. Cardamom (Elaichi)



Fig – Cardamom / Elaichi (*Elettaria cardamomum*)



- Scientific Name: *Cinnamomum verum* J.Presl / *Cinnamomum zeylanicum* Blume
- Synonyms: Dalchini, True cinnamon, Ceylon cinnamon
- Biological Source: Dried inner bark of shoots of *Cinnamomum verum* trees
- Family: Lauraceae
- Chemical Constituents: Cinnamaldehyde (60–75%), eugenol, cinnamic acid, procyanidins (type-A)
- Activity: Thermogenic (TRPA1 activation), insulin sensitizer (PTP1B inhibition), blood glucose reducer
- Uses: Obesity management, antidiabetic, antimicrobial, antifungal, and cardioprotective activities.

5. Cumin (Jeera)



Fig: – Cumin / Jeera (*Cuminum cyminum*)

- Scientific Name: *Cuminum cyminum* L.
- Synonyms: Jeera, Jira, Roman caraway
- Biological Source: Dried ripe fruits (seeds) of *Cuminum cyminum* L.
- Family: Apiaceae (Umbelliferae)
- Chemical Constituents: Cuminaldehyde (25–35%), cuminic alcohol, gamma-terpinene, beta-pinene, p-cymene
- Activity: Fat metabolism, aldose reductase inhibitor, BMI reduction, hypolipidemic
- Uses: Weight management, blood pressure regulation, antiasthmatic activity, and digestive aid.

6. Ajwain (Carom Seeds)



Fig: – Ajwain / Carom Seeds (*Trachyspermum ammi*)

- Scientific Name: *Trachyspermum ammi* (L.) Sprague
- Synonyms: Carom seeds, Bishop's weed, Omam



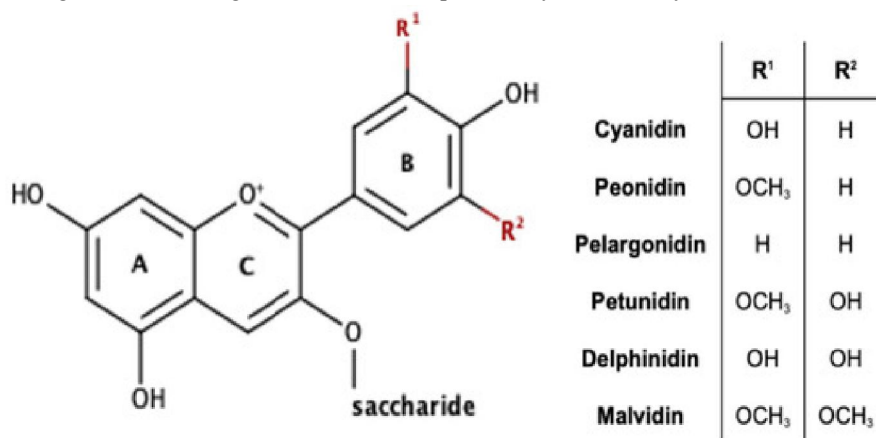
- Biological Source: Dried ripe fruits of *Trachyspermum ammi* (L.) Sprague
- Family: Apiaceae
- Chemical Constituents: Thymol (35–60%), gamma-terpinene, para-cymene, carvacrol
- Activity: Digestive enzyme activator (lipase, protease), anti-adipogenic, carminative, hypolipidemic
- Uses: Weight management, digestive support, antifungal activity, bronchodilator effect, and bone health support.

7. *Clitoria ternatea* (Butterfly Pea / Aparajita)



Fig – *Clitoria ternatea* (Butterfly Pea)

- Scientific Name: *Clitoria ternatea* L.
- Synonyms: Aparajita, Asian pigeonwings, Blue pea, Butterfly pea
- Biological Source: Flowers of *Clitoria ternatea* L.
- Family: Fabaceae
- Chemical Constituents: Ternatins A1–D3 (anthocyanins), kaempferol, quercetin, myricetin, p-coumaric acid
- Activity: Alpha-glucosidase inhibitor, alpha-amylase inhibitor, PPAR-gamma downregulator, antioxidant, natural blue colorant
- Uses: Weight management, blood sugar reduction, nootropic activity, anti-anxiety effect, and natural food colorant.



Chemical Structure: Ternatins / Anthocyanins (polyacylated delphinidin glycosides)



EXCIPIENT PROFILE

1. Citric Acid (Anhydrous)

Parameter	Details
IUPAC Name	2-hydroxypropane-1,2,3-tricarboxylic acid
Molecular Formula	C ₆ H ₈ O ₇
Molecular Weight	192.12 g/mol
Appearance	White crystalline powder
Solubility	Freely soluble in water
Function	Primary acid source for effervescent reaction; pH modifier; preservative
pKa values	pKa1 = 3.13, pKa2 = 4.76, pKa3 = 6.40

2. Sodium Bicarbonate

Parameter	Details
IUPAC Name	Sodium hydrogen carbonate
Molecular Formula	NaHCO ₃
Molecular Weight	84.01 g/mol
Appearance	White crystalline powder
Solubility	Slightly soluble in water (9 g/100 mL at 25°C)
Function	Alkali source for effervescent reaction; reacts with citric acid to release CO ₂ ; antacid

3. Corn Starch

Parameter	Details
Source	Endosperm of Zea mays (maize)
Appearance	Fine white powder
Moisture content	< 14% (pharmacopoeial standard)
Function	Diluent; moisture-scavenging/drying agent; improves powder blend flow and bulk
Compatibility	Compatible with all Polyherbalpowders and effervescent excipients

4. Orange Peel Powder

Parameter	Details
Biological Source	Dried peel of Citrus sinensis (L.) Osbeck
Family	Rutaceae



Parameter	Details
Active Constituents	Hesperidin, nobiletin, d-limonene, flavonoids, Vitamin C
Appearance	Orange-yellow fine powder with characteristic citrus aroma
Function	Natural flavouring agent; improves palatability and aroma; antioxidant; improves colour of reconstituted solution

PLAN OF WORK

Formulation and Evaluation of Herbal Effervescent Powder for Weight Loss

1. Selection of Topic

- Selection of the research topic:

“Formulation and Evaluation of Herbal Effervescent Powder for Weight Loss.”

2. Literature Survey

- Review of anti-obesity herbal drugs.
- Study of effervescent powder technology.
- Collection of information from journals, books, and research articles.

3. Selection of Ingredients

- Selection of herbal active ingredients.
- Selection of pharmaceutical excipients.
- Study of therapeutic importance of selected herbs.

4. Authentication of Herbal Drugs

- Authentication of herbal materials as per IHP and API standards.
- Verification of purity and quality of crude drugs.

5. Preformulation Studies

- Organoleptic evaluation.
- Phytochemical screening.
- Evaluation of flow properties of individual powders.
- Determination of bulk density, tapped density, angle of repose, Carr's index, and Hausner ratio.

6. Preparation of Individual Herbal Powders

- Drying of herbs.
- Grinding of herbs into fine powder.
- Sifting through suitable sieve size.
- Preparation of uniform herbal powder blend.

7. Formulation of Effervescent Powder

- Preparation of different formulation batches (F1–F4).
- Optimization of composition.
- Mixing of herbal powders with effervescent agents.



8. Evaluation of Formulation

- Physical evaluation (colour, odour, appearance, pH).
- Evaluation of flow properties.
- Determination of bulk density and tapped density.
- Angle of repose, Carr's index, and Hausner ratio.
- Effervescence time and wetting time.
- Assay and microbial limit test.

9. Stability Study and Compatibility Study

- Stability study of optimized formulation at different time intervals.
- Study periods: 0 Day, 1 Month, 3 Months, and 6 Months.
- Compatibility study using FTIR analysis.

10. Documentation and Submission of Dissertation

- Data compilation and analysis.
- Thesis writing and formatting.
- Final dissertation preparation.
- Submission of thesis.

Preliminary Phytochemical Screening / Phytochemical Evaluation

The Polyherbal powder was subjected to preliminary phytochemical investigation for identification of various phytoconstituents such as alkaloids, flavonoids, saponins, phenols, tannins, cardiac glycosides, and amino acids using standard procedures.

Evaluation Tests

- ☐ Wagner test
- ☐ Flavonoids test
- ☐ Saponins test
- ☐ Phenol test
- ☐ Tannin test
- ☐ Cardiac glycoside
- ☐ Amino acids test

1 Test for Alkaloids (Wagner's Test)

Procedure

2 mL of Polyherbal extract was treated with few drops of Wagner's reagent (iodine in potassium iodide solution).

Observation

Formation of reddish-brown precipitate.

Result

Presence of alkaloids was confirmed.



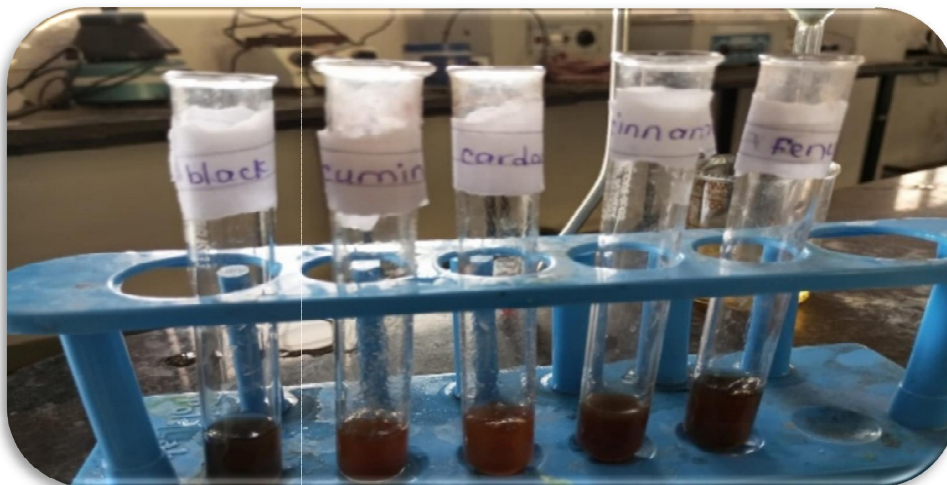


Fig: Wagner's Test

2. Test for Flavonoids

Procedure

To 2 mL of extract, few drops of dilute sodium hydroxide solution were added followed by dilute hydrochloric acid.

Observation

Yellow coloration disappeared after addition of acid.

Result

Presence of flavonoids was confirmed.

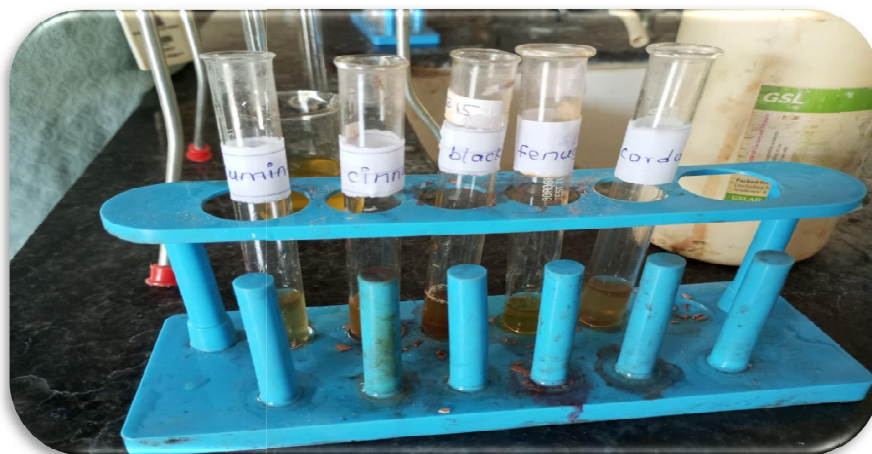


Fig: Flavonoids Test

3. Test for Saponins (Foam Test)

Procedure

The extract was diluted with distilled water and shaken vigorously for 15 minutes.

Observation

Stable persistent froth formation was observed.



Result

Presence of saponins was confirmed.

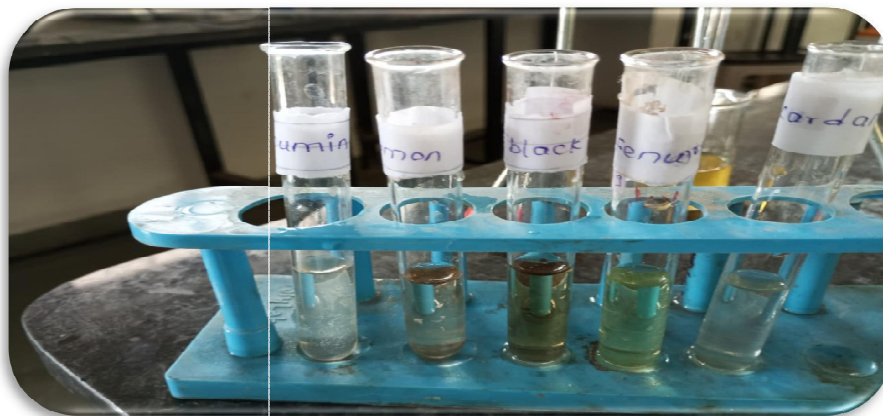


Fig: Foam Test

4. Test for Phenols

Procedure

Few drops of ferric chloride solution were added to the extract.

Observation

Bluish-black coloration appeared.

Result

Presence of phenolic compounds was confirmed.

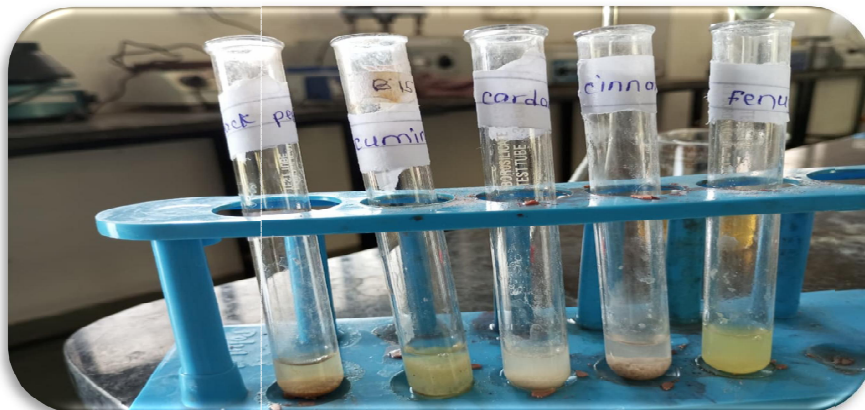


Fig: Phenols Test

5. Test for Tannins

Procedure

To the extract, ferric chloride solution was added.

Observation

Greenish-black or blue-black coloration was observed.

Result

Presence of tannins was confirmed.





Fig: Tannins Test

6. Test for Cardiac Glycosides (Keller-Killiani Test)

Procedure

The extract was treated with glacial acetic acid containing ferric chloride followed by concentrated sulfuric acid along the sides of the test tube.

Observation

Brown ring formation at the interface.

Result

Presence of cardiac glycosides was confirmed.

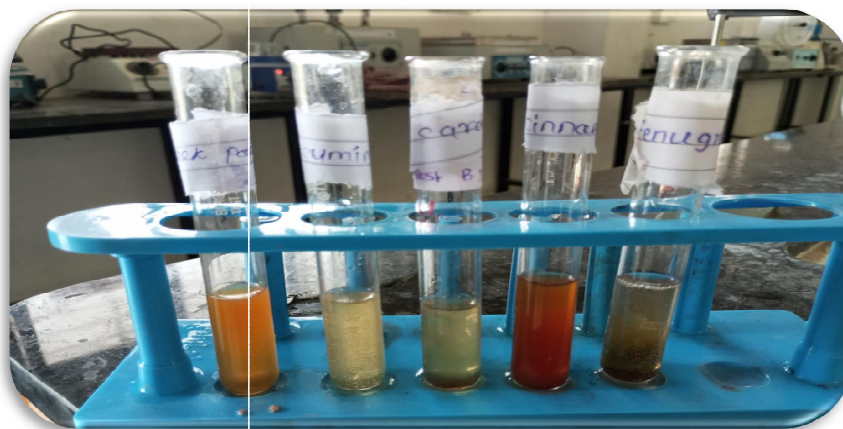


Fig: Cardiac Glycosides Test

7. Test for Amino Acids (Ninhydrin Test)

Procedure

Few drops of ninhydrin reagent were added to the extract and heated.

Observation

Purple or blue coloration appeared.

Result

Presence of amino acids was confirmed.



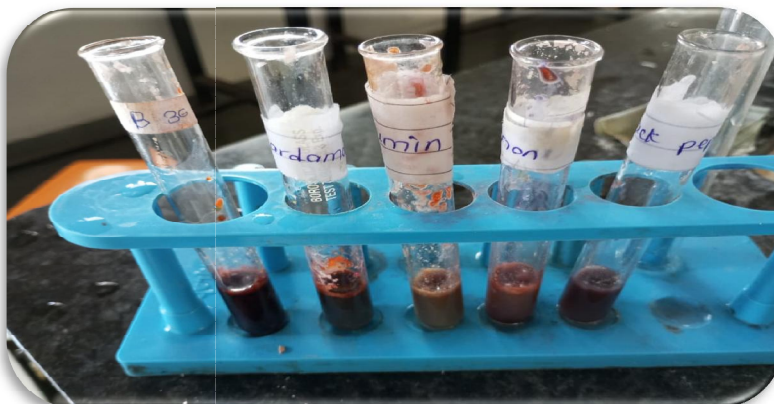


Fig: Amino Acids Test

Result Table

Sr. No.	Phytochemical Test	Result
1	Wagner's Test	Present
2	Flavonoids Test	Present
3	Saponins Test	Present
4	Phenol Test	Present
5	Tannin Test	Present
6	Cardiac Glycoside Test	Present
7	Amino Acids Test	Present

The preliminary phytochemical screening of the formulated Polyherbal effervescent powder confirmed the presence of various bioactive phytoconstituents such as alkaloids, flavonoids, saponins, phenols, tannins, cardiac glycosides, and amino acids. These phytoconstituents may contribute to the anti-obesity and antioxidant activity of the formulation.

PROCEDURE

• Procedure of Formulation for Polyherbal Effervescent Powder

Step 1: Cleaning and Drying

Cleaning: All Polyherbal plants used in the effervescent powder formulation were thoroughly cleaned. Dirt, dust, and other contaminants were removed. All Polyherbal materials were washed and rinsed to ensure purity. Method used: Water washing.

Drying: All Polyherbal plant materials were dried to remove moisture and preserve potency. Method used: Sunlight drying — materials spread in a single layer on clean trays, covered with cheesecloth. Complete drying was confirmed by absence of moisture and crisp texture.

Step 2: Grinding

Each dried Polyherbal ingredient was ground separately into a fine powder using a mechanical grinder. Grinding reduces particle size and ensures uniform texture. Method: Mechanical grinding using a grinder.





Fig: Polyherbal powders individually after grinding — Black pepper, Fenugreek, Cinnamon, Cardamom, Cumin, Ajwain, Clitoria ternatea.

Step 3: Mixing

All individual Polyherbal powders were combined in a clean, dry mortar or grinder. The powders were mixed by geometric dilution — starting with the smallest quantity (black pepper 0.20 g), progressively adding larger quantities. The mixture was mixed for 15 minutes to ensure homogeneity. Corn starch and orange peel powder were added and mixed uniformly.



Fig: Mixing of Polyherbal powder blend in mortar.

Step 4: Adding Effervescent Excipients

Citric acid (anhydrous) and sodium bicarbonate — both pre-dried at 40°C for 30 minutes — were added carefully to the Polyherbal blend. Citric acid was incorporated first and mixed thoroughly. Sodium bicarbonate was then added slowly with continuous gentle mixing using a spatula. All blending was performed in a low-humidity environment (RH < 40%) to prevent premature effervescent reaction.



Step 5: Drying

The final powder blend was spread in a thin layer on a clean tray in a hot air oven at 40°C for 30 minutes to reduce any residual moisture acquired during mixing. Moisture content was checked by LOD and confirmed to be < 1.2% before sachet filling.

Step 6: Powdering

After drying, if any agglomerates or lumps had formed, the blend was gently broken up and passed through a #40 mesh sieve. Method: Mortar and pestle or gentle mechanical size reduction.

Step 7: Sifting and Sachet Filling

The final powder blend was sifted through a #40 mesh sieve to ensure uniform particle size and remove any lumps. The sifted powder was immediately filled into pre-formed aluminium foil-laminated, moisture-proof sachets at a fill weight of $5.0 \pm 2\%$ and heat-sealed. Filled sachets were stored in sealed polyethylene bags with silica gel desiccant until evaluation.

EVALUATION TEST OF POLYHERBAL EFFERVESCENT POWDER

1. Evaluation Parameters

- Organoleptic characteristics
- Tapped density
- Angle of repose
- Bulk density
- Effervescence test
- pH determination
- Carr's index
- Hausner's ratio
- Moisture content
- Irritancy test
- Foaming / solubility test
- Stability test

Evaluation tests are procedures used to assess the quality, efficacy, and safety of a product. These tests help ensure the product meets quality standards, is safe for oral consumption, and performs as claimed.

1. Organoleptic Characteristics:

Organoleptic evaluation is performed to observe the physical appearance of the formulation such as color, odor, taste, texture, and overall appearance. It helps in identifying the quality and acceptability of the powder.

2. Tapped Density:

Tapped density is the density attained after mechanically tapping a measuring cylinder containing the powder sample. It provides information about packing ability and flow characteristics of the powder.

3. Angle of Repose:

Angle of repose is the maximum angle formed between the surface of the powder pile and the horizontal plane. It is used to determine the flow property of the powder blend.

4. Bulk Density:

Bulk density is defined as the ratio of mass of powder to its untapped bulk volume. It indicates packing and flow behavior of the formulation.



5. Effervescence Test:

The effervescence test is carried out to evaluate the release of carbon dioxide gas when the formulation comes in contact with water. It helps determine the dispersion efficiency and reaction time of the effervescent powder.

6. pH Determination:

The pH of the prepared solution is measured using a digital pH meter to ensure suitability, stability, and patient acceptability of the formulation.

7. Carr's Index:

Carr's index is used to evaluate the compressibility and flowability of the powder blend. Lower values indicate better flow properties.

$$\text{Carr's Index} = \frac{\text{Tapped Density} - \text{Bulk Density}}{\text{Tapped Density}} \times 100$$

8. Hausner's Ratio:

Hausner's ratio is a parameter used to determine interparticle friction and flow characteristics of powders. A lower ratio indicates good flowability.

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

9. Moisture Content:

Moisture content determination is important to evaluate the amount of water present in the formulation, as excess moisture may affect stability and effervescence.

10. Irritancy Test:

The irritancy test is performed to check whether the formulation causes redness, itching, irritation, or any adverse effect on the skin.

11. Foaming / Solubility Test:

This test is carried out to determine the solubility behavior and foaming characteristics of the effervescent powder in water.

12. Stability Test:

Stability testing is performed to evaluate the physical, chemical, and organoleptic stability of the formulation during storage under specified conditions.

FORMULATION OF POLYHERBAL EFFERVESCENT POWDER

Sr. No.	Ingredients	F1 (g)	F2 (g)	F3 (g)	F4 (g)
1	Black Pepper Powder	0.10	0.15	0.20	0.20
2	Fenugreek Powder	0.50	0.60	0.70	0.60
3	Cinnamon Powder	0.30	0.40	0.40	0.40
4	Cardamom Powder	0.10	0.10	0.15	0.20
5	Cumin Powder	0.20	0.20	0.25	0.50
6	Ajwain Powder	0.20	0.25	0.25	0.50
7	<i>Clitoria ternatea</i> Powder	0.20	0.25	0.30	0.30
8	Citric Acid	1.00	1.00	0.95	1.00
9	Sodium Bicarbonate	1.80	1.60	1.45	0.80
10	Corn Starch	0.30	0.10	0.15	0.20



11	Orange Peel Powder	0.30	0.35	0.40	0.30
	Total Weight	5 g	5 g	5 g	5 g

Table: Formulation Composition of Polyherbal Effervescent Powder for Weight Loss

II. CONCLUSION

A Polyherbal effervescent powder for weight management was successfully formulated and evaluated using a rational blend of seven traditionally used, scientifically validated Indian herbs and spices — Black pepper (*Piper nigrum*), Fenugreek (*Trigonella foenum-graecum*), Cinnamon (*Cinnamomum verum*), Cardamom (*Elettaria cardamomum*), Cumin (*Cuminum cyminum*), Ajwain (*Trachyspermum ammi*), and Clitoria ternatea — combined with effervescent excipients in a 5 g per sachet format.

Four formulation batches (F1–F4) were systematically optimized. F1 failed due to insufficient effervescence; F2 failed due to excess fenugreek causing an irritating smell; F3 failed due to insufficient thermogenic actives and higher moisture content; F4 was the optimized and successful formulation.

The blend of Polyherbal ingredients provides multiple complementary antiobesity mechanisms:

- Thermogenesis stimulation (piperine from black pepper; cinnamaldehyde from cinnamon)
- Appetite suppression and satiety (galactomannan and tryptophan from fenugreek)
- Pancreatic lipase inhibition (thymol from ajwain; saponins from fenugreek)
- Blood glucose and insulin regulation (procyanidins from cinnamon; ternatins from Clitoria ternatea)
- Digestive enzyme stimulation and gut health (cuminaldehyde from cumin; thymol from ajwain)
- Anti-inflammatory action on adipose tissue (eucalyptol from cardamom; ternatins from Clitoria ternatea)
- Bioavailability enhancement of all co-administered actives (piperine from black pepper)

The effervescent dosage form effectively masked the bitter and pungent taste of Polyherbal powders, providing excellent palatability, rapid dissolution, improved bioavailability, and superior patient compliance. The formulation is safe (no irritation), cost-effective, and made entirely from natural ingredients.

Overall, the Polyherbal effervescent powder represents a promising, natural, gentle, and effective supportive supplement for weight management and metabolic health, suitable for healthy overweight individuals as part of a comprehensive lifestyle modification programme.

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