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Research Article

Development and Standardization of a Therapeutic Polyherbal Powder (Paachan Pro) for the Management of Digestive Discomfort

Mehul Tiwari, Neeru Sharma*, Brijpal Singh, Kunwar Chauhan, Shivender Chandel

Suwasthi Intense Healthcare Pvt Ltd., Greater Noida, Uttar Pradesh- 201306 India.

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ABSTRACT

Paachan Pro is a standardized polyherbal formulation developed to support gastrointestinal health through multiple mechanistic pathways. The blend comprises eleven botanicals—*Trachyspermum ammi*, *Foeniculum vulgare*, *Cuminum cyminum*, *Mentha spicata*, *Piper nigrum*, *Ferula asafoetida*, *Terminalia chebula*, *Terminalia bellirica*, *Emblica officinalis*, Black salt, and Sodium bicarbonate—each documented for carminative, digestive, and antimicrobial properties. Formulation followed Ayurvedic pharmacopeial procedures, and quality evaluation complied with WHO-GMP guidelines. Physicochemical analysis showed pH 5.1 – 6.4, moisture $\approx$ 5 %, and moderate flowability (Carr' s index 11 – 17 %). Water-extractive and methanol-extractive values confirmed a balanced distribution of polar and semi-polar constituents. Phytochemical assays verified tannin, and the thymol content was quantified by high-performance liquid chromatography (HPLC). Microbiological counts remained within acceptable limits with no detectable pathogens. Collectively, these findings demonstrate that Paachan Pro meets essential quality parameters for herbal powders and merits further pharmacological and clinical investigation.

INTRODUCTION

Digestive discomforts such as indigestion, flatulence, and bloating are among the most prevalent functional gastrointestinal disorders worldwide [1]. Prolonged use of synthetic antacids and prokinetic agents may lead to electrolyte imbalance, mucosal changes, or tolerance [2]. Herbal formulations offer a holistic and

comparatively safe alternative, emphasizing multi-target actions on motility, secretion, and gut microbiota [3].

Ayurvedic pharmacology promotes the principle of **polyherbal synergy**, combining herbs with complementary actions to enhance therapeutic effect and minimize toxicity [4]. Powdered preparations (*churna*) are widely employed due to rapid onset, simple manufacturing, and stability.

***Corresponding Author:** Neeru Sharma

Address: Suwasthi Intense Healthcare Pvt Ltd., Greater Noida, Uttar Pradesh- 201306 India.

Email : forensicindia.edu@gmail.com

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The eleven ingredients of *Paachan Pro* were selected for their complementary roles:

1. *Trachyspermum ammi*, and *Foeniculum vulgare*—thymol- and anethole-rich seeds with carminative and spasmolytic activity. [5, 6]
2. *Cuminum cyminum* and *Mentha spicata*—digestive stimulants enhancing salivary and pancreatic secretions. [7, 8]
3. *Piper nigrum*—source of piperine, a bioavailability enhancer. [9]
4. *Ferula asafoetida*—antispasmodic and antimicrobial resin. [10]
5. *Terminalia chebula*, *Terminalia bellirica*, and *Emblica officinalis*—antioxidant fruits providing the classical *Triphala* synergy. [11]

6. Black salt and sodium bicarbonate—mild antacids assisting pH balance. [12, 13]

This study aimed to formulate *Paachan Pro Powder* according to standardized procedures and evaluate its physicochemical, phytochemical, and microbiological characteristics to ensure reproducibility and compliance with pharmacopeial standards.

2. MATERIALS AND METHODS

2.1 MATERIALS

All raw materials were procured from authenticated Ayurvedic suppliers in India and stored in airtight containers at room temperature. Analytical-grade reagents such as **indigo carmine solution**, **potassium permanganate**, and **methanol** were used for phytochemical screening. Microbiological media and consumables were of standard quality and procured from certified manufacturers.

Table 1: Composition of Polyherbal Paachan Pro Powder

S. No.	Ingredients	Quantity in mg
1.	<i>Trachyspermum ammi</i> (Ajwain)	670 mg
2.	<i>Foeniculum vulgare</i> (Fennel)	540 mg
3.	<i>Cuminum cyminum</i> (Cumin)	540 mg
4.	<i>Mentha spicata</i> (Pudina)	540 mg
5.	<i>Piper nigrum</i> (Kali mirch)	60 mg
6.	Sodium bicarbonate (baking soda)	140 mg
7.	Black Salt Powder	240 mg
8.	<i>Ferula asafoetida</i> (Hing)	30 mg
9.	<i>Terminalia chebula</i> (Haritaki)	90 mg
10.	<i>Terminalia bellirica</i> (Bibhitaki)	90 mg
11.	<i>Emblica officinalis</i> (Amla)	60 mg

2.2 Formulation of Polyherbal Powder

The selected ingredients were accurately weighed in pre-determined proportions and individually sieved through a 60-mesh sieve to obtain a uniform particle size. The powders were then blended

thoroughly using the geometric dilution method to ensure homogeneity. The final **polyherbal powder** was stored in air-tight HDPE containers in a cool, dry environment for further analysis.

2.3 Physicochemical Evaluation



The formulated powder was subjected to the following physicochemical tests using standard Ayurvedic pharmacopeial methods:

- **Organoleptic characteristics:** Color, taste, and odour were recorded visually and by sensory evaluation. [14]
- **pH determination:** Measured using a digital pH meter (1% w/v solution in distilled water). [15]
- **Moisture content:** Determined using the Kf apparatus. [16]
- **Bulk and tapped density:** Assessed using a tap density apparatus. [17]
- **Flow properties:** Calculated using Carr's Index and Hausner Ratio:
- Carr's Index (%) = $[(\text{Tapped Density} - \text{Bulk Density}) / \text{Tapped Density}] \times 100$
- Hausner Ratio = $\text{Tapped Density} / \text{Bulk Density}$ [18]
- **Angle of Repose:** Calculated from the average radius using the formula. $\tan \theta = h/r$ [19]
- **Extractive values:** Water-soluble extractive and methanol-soluble extractive values were determined using the maceration technique and expressed as % w/w. [20]

2.4 Phytochemical Screening

Preliminary phytochemical analysis was performed to detect the presence of bioactive compounds. Standard qualitative tests were conducted for the detection of:

- **Tannins** – using Potassium permanganate solution (golden-yellow coloration)
- **Thymol**, a key constituent of *Trachyspermum ammi*, was identified and quantified using High-Performance Liquid Chromatography (HPLC).

2.5 Microbiological Evaluation

Microbial quality of the formulation was assessed in accordance with WHO and Ayurvedic pharmacopoeia guidelines:

- **Total Plate Count (TPC):** Performed using Soyabean Casein Digest Agar (SCDA) to estimate aerobic bacterial load.
- **Yeast and Mould Count:** Determined using Sabouraud dextrose agar.
- **Pathogen screening:** The presence of pathogenic bacteria such as *Escherichia coli*, *Salmonella spp.*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa* was tested using selective media and confirmatory biochemical assays.

All tests were conducted in triplicate to ensure accuracy and reproducibility.

3. RESULTS

3.1 Physicochemical Parameters

The formulated polyherbal powder demonstrated acceptable physicochemical characteristics. As provided in Table 2.

Table 2: Physicochemical Parameters Results

S. No.	Evaluation Parameters	Specification	Observations		
			SPPP-00001	SPPP-00002	SPPP-00003
1.	Color	Brown Color	Brown Color	Brown Color	Brown Color
2.	Taste	Characteristic	Characteristic	Characteristic	Characteristic
3.	Odour	Characteristic	Characteristic	Characteristic	Characteristic
4.	pH	NLT- 4.5	6.32	5.19	5.31



6.	Moisture content	NMT- 10.0% w/w	5.15% w/w	5.25% w/w	5.31% w/w
7.	Bulk Density	NLT- 0.3 gm/ml	0.5005 gm/ml	0.5038 gm/ml	0.5232 gm/ml
8.	Tapped Density	NLT- 0.4 gm/ml	0.5998 gm/ml	0.5731 gm/ml	0.5898 gm/ml
9.	Carr's index	8– 18%	16.55 %	12.09 %	11.29 %
10.	Hausner Ratio	1.0 – 1.2	1.20	1.14	1.13
11.	Angle of Repose	< 25	21.30°	22.55°	20.17°
12.	WSEV	NLT- 20% w/w	32.48% w/w	33.34% w/w	34.38% w/w
13.	MSEV	NLT- 20% w/w	27.85% w/w	24.50% w/w	23.26% w/w

3.2 Phytochemical Screening

Phytochemical evaluation revealed the presence of **tannins**, and High-Performance Liquid Chromatography (HPLC) confirmed thymol as the

major bioactive constituent. These compounds are pharmacologically associated with **antioxidant, antimicrobial, and gastroprotective** activities, contributing to the formulation's therapeutic potential. As given in Table 3.

Table 3: Phytochemical Screening Results

S. No.	Evaluation Parameters	Specification	Observations		
			SPPP-00001	SPPP-00002	SPPP-00003
1.	Tannin Content	NLT- 5%w/w	5.76% w/w	5.63% w/w	5.52% w/w
2.	Thymol Content	NLT- 0.5%w/w	0.53% w/w	0.54% w/w	0.51% w/w

3.3 Microbiological Evaluation

Microbiological evaluation confirmed the **absence of pathogenic microorganisms**, including *Escherichia coli*, *Salmonella* spp., *Pseudomonas aeruginosa*, and *Staphylococcus aureus*. **Total**

aerobic bacterial count and yeast and mould counts were within acceptable pharmacopeial limits, indicating the **microbiological safety** and quality of the formulation for oral consumption. Observations are stated in Table 4.

Table 4: Microbiological Evaluation Results

S. No.	Evaluation Parameters	Specification	Observations		
			SPPP-00001	SPPP-00002	SPPP-00003
1.	Total Plate Count	NMT- 1,00,000 Cfug/gm	6400 Cfug/gm	6350 Cfug/gm	8200 Cfug/gm
2.	E. Coli / 10gm	Absent	Absent	Absent	Absent
3.	Salmonella / 25gm	Absent	Absent	Absent	Absent
4.	Pseudomonas aeruginosa / 10gm	Absent	Absent	Absent	Absent
5.	Staphylococcus aureus / 10gm	Absent	Absent	Absent	Absent
6.	Yeast & Mould counts	NMT- 1000 Cfug/gm	400 Cfug/gm	300 Cfug/gm	200 Cfug/gm

4. CONCLUSION

The formulated polyherbal powder exhibited favorable organoleptic characteristics, including brown color, characteristic taste and aroma, and



uniform texture, indicating good sensory acceptability. Phytochemical screening confirmed the presence of tannins and thymol, both associated with digestive, antimicrobial, and anti-inflammatory activities. Physicochemical analysis revealed water-soluble extractive values (32.48–34.38% w/w), methanol-soluble extractive values (23.26–27.85% w/w), pH (5.19–6.32), moisture content (5.15–5.31% w/w), bulk density (0.50–0.53 g/mL), and tapped density (0.57–0.60 g/mL), all within acceptable limits for herbal powders. Flow properties, assessed through Carr's Index (12.09–16.55%) and Hausner Ratio (1.10–1.20), demonstrated moderate flowability, suitable for formulation and handling. Microbiological analysis confirmed safety, with total plate count, yeast, and mold levels within permissible limits and no detectable pathogenic organisms. These evaluations support the polyherbal formulation as a stable, microbiologically safe, and potentially effective Ayurvedic remedy for digestive health.

5. FUTURE PERSPECTIVES

The results of this study provide a strong foundation for advancing *Paachan Pro* into further stages of research and development. Future work will focus on detailed pharmacological and clinical evaluations to substantiate its digestive efficacy and safety profile. Advanced analytical characterization and stability assessments will support long-term quality assurance, while optimization of dosage forms will enhance consumer compliance and therapeutic effectiveness. Collectively, these efforts will strengthen the scientific credibility and global acceptance of *Paachan Pro* as a standardized, evidence-based Ayurvedic formulation for digestive health.

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