



Research Article

PHYTOCHEMICAL AND BIOCHEMICAL ANALYSIS OF A SIDDHA HERBO-MINERAL
FORMULATION, *PUDHINA MAATHIRAI*

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ABSTRACT

The Siddha system of medicine, one of the ancient traditional medical systems offers a holistic approach to health by addressing a wide spectrum of diseases and emphasizing the crucial role of gut health in maintaining overall well-being. *Pudhina Maathirai*, a classical siddha formulation mentioned in *Noigalukku Siddha Parigaram (Part-1)* is indicated for indigestion, vomiting and diarrhea. The present study aims to evaluate the preliminary phytochemical and biochemical properties of *Pudhina Maathirai* to provide scientific validation for its traditional use. *Pudhina Maathirai* was prepared according to classical siddha literature and preliminary phytochemical and biochemical analysis were carried out to identify its major constituents. Analytical evaluation revealed the presence of alkaloids, flavonoids, steroids, phenols, sugar, tannins and triterpenoids. Biochemical analysis revealed the presence of chlorides. Other acid radicals such as carbonate, sulphide, phosphate, fluoride, oxalate, borate and nitrate were absent. Also, the basic radical analysis showed the absence of heavy metals including lead, arsenic, mercury, copper, iron, zinc, silver and magnesium. These identified compounds are known for their anti-secretory, anti-motility, anti-inflammatory, antioxidant, antimicrobial, antiemetic, antispasmodic, astringent and gastroprotective activities. The presence of chlorides, which is essential for maintaining electrolyte balance and gastric acid secretion. The findings of this study provide a scientific rationale for the traditional use of *Pudhina Maathirai*. However further pharmacological and clinical studies are required to support its therapeutic efficacy and safety.

INTRODUCTION

Gastric problems are among the most common health complaints affecting individuals worldwide. They significantly affect the quality of life and may range from mild functional disturbances to severe pathological disorders. The Siddha system of medicine offers numerous therapeutic approaches for the management of gastrointestinal disorders. One of the basic concepts in siddha system is *Aamam*^[1] (indigestion, disease connected with the mucous in the intestines) is considered a primary cause of many diseases.

Regulation of *Aamam* is believed to restore normal physiological functions and helps in the management of various disorders. Also, this system strongly recommends purgation therapy prior to initiating treatment for any disease. This also indicates the importance of maintaining good gut health. It includes numerous formulations aimed at improving gut health and digestive function. These preparations help regulate digestion, relieve gastrointestinal disturbances, and promote overall well-being through their carminative and gastroprotective properties. The formulation *Pudhina Maathirai* is mentioned in *Noigalukku Siddha Parigaram (Part-1)* is indicated for indigestion, vomiting and diarrhoea. This study aims to evaluate the phytochemical and biochemical properties of this formulation to provide a scientific basis for its traditional use.

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MATERIALS AND METHODS

Drug Selection: *Pudhina Maathirai* is mentioned in *Noigalukku Siddha Parigaram* (Part-1).

Table 1: Ingredients of *Pudhina Maathirai*

S.No	Name	Botanical Name	Quantity
1	<i>Chukku</i>	<i>Zingiber officinale</i>	1/2 Balam (17.5 gm)
2	<i>Sombu</i>	<i>Foeniculum vulgare</i>	1/2 Balam (17.5 gm)
3	<i>Seeragam</i>	<i>Cuminum cyminum</i>	1/2 Balam (17.5 gm)
4	<i>Inji</i>	<i>Zingiber officinale</i>	1/2 Balam (17.5 gm)
5	<i>Milagu</i>	<i>Piper nigrum</i>	1/2 Balam (17.5 gm)
6	<i>Pudhina ilai</i>	<i>Mentha arvensis</i>	1/4 Balam (8.75 gm)
7	<i>Elumichai pazha saaru</i>	<i>Citrus limon</i>	Required quantity

S.No	Name	Chemical Name	Quantity
1	<i>Kariuppu</i>	Sodium Chloride	1/2 Balam (17.5 gm)

Collection of raw drugs: The raw drugs are brought from raw drug shops in and around Tirunelveli.

Purification: The drugs are purified as per the siddha literature.

Preparation of the drug: All the ingredients were taken in the exact proportions as specified in the above table. They were ground well and made into a paste using lemon juice. The paste was then rolled into small tablets (500 mg) and dried in shade.

Administration of the drug: Oral administration

Dosage: *Sundaikaai alavu* (500mg) twice a day for five days with hot water.

Phytochemical Analysis of *Pudhina Maathirai*

Phytochemical Analysis of *Pudhina Maathirai* (Table 2) was performed at Noble research solutions, Chennai.

Table 2: Phytochemical Analysis of *Pudhina Maathirai*

S.No	Experiment	Observation	Inference
1.	Test for alkaloids Mayer's Test: Two milliliters of Mayer's reagent was added to the test sample.	A dull white precipitate revealed the presence of alkaloids.	Positive
2.	Test for coumarins One milliliter of 10% sodium hydroxide was added to the test sample.	Formation of yellow color indicates the presence of coumarins.	Negative
3.	Test for saponins Five milliliters of water was added to the test sample, and the tube was shaken vigorously.	Copious lather formation indicates the presence of Saponins.	Negative
4.	Test for glycosides- Borntrager's Test The test drug was hydrolyzed with concentrated hydrochloric acid for two hours on a water bath, then filtered. The hydrolysate was subjected to the following tests. Two milliliters of the filtered hydrolysate were mixed with three milliliters of chloroform, shaken, and the chloroform layer was separated. Ten percent ammonia solution was added to the chloroform layer.	Pink colour indicates presence of glycosides.	Negative
5.	Test for flavonoids Alkaline reagent test: Two to three drops of sodium hydroxide were added to two milliliters of extract.	Initially, a deep yellow colour appeared but it gradually became colourless by adding few drops of dilute HCL, indicating that flavonoids were present.	Positive

6.	Test for phenols Lead acetate test: Three milliliters of 10% lead acetate solution was added to the test sample.	A bulky white precipitate indicated the presence of phenolic compounds.	Positive
7.	Test for steroids Two milliliters of chloroform was added to the test sample, along with a few drops of concentrated sulfuric acid (3ml), and the mixture was shaken well.	The upper layer in the test tube was turned into red and sulphuric acid layer showed yellow with green fluorescence. It showed the presence of steroids.	Positive
8.	Triterpenoids Liebermann-Burchard test: A few drops of acetic anhydride were added to the chloroform solution, mixed well, and one milliliter of concentrated sulfuric acid was added from the side of the test tube.	Presence of triterpenoids is indicated by the appearance of red ring.	Positive
9.	Test for Cyanins A. Anthocyanin One milliliter of 2N sodium hydroxide was added to the test sample, and it was heated for five minutes at 100°C. B. Betacyanin: The test sample was mixed with ethanol.	Bluish green colour formation indicates the presence of anthocyanin. Formation of red violet colour indicates the presence of betacyanin.	Negative
10.	Test for Carbohydrates - Benedict's test Approximately 0.5 milliliters of Benedict's reagent was added to the test sample. The mixture was heated for two minutes in a boiling water bath.	A characteristic-coloured precipitate indicates the presence of sugar.	Positive
11.	Proteins (Biuret Test) A 1% solution of copper sulphate was added to the extract, followed by a 5% solution of sodium hydroxide.	Formation of violet purple colour indicates the presence of proteins	Negative
12.	Test for tannins: Five milliliters of water was added to the test sample.	Formation of dark blue or greenish black colour	Positive

Biochemical Analysis of Pudhina Maathirai

Biochemical Analysis of *Pudhina Maathirai* (Table 3) was conducted at Noble research solutions, Chennai.

Table 3: Biochemical Analysis of Pudhina Maathirai Analytical Investigation on Test for Acid Radicals

S.No	Test for Specific Acid Radical	Indication/ Observation	Inference	Results
1.	Test for Carbonates Adding 1ml of concentration (conc.) HCL to 1ml of the test solution.	Formation of brisk effervescence indicates the presence of carbonates.	Absence of brisk effervescence	Negative
2.	Test for chlorides Adding 1ml of silver nitrate solution to 2ml of test solution.	Appearance of white precipitate indicates the presence of chlorides.	Presence of white precipitate	Positive
3.	Test for sulfates Adding diluted H ₂ SO ₄ to 1ml of the test sample until effervescence stopped, then adding 1ml of barium chloride solution.	Appearance of white precipitate indicates the presence of sulfates.	Absence of white precipitate.	Negative
4.	Test for sulfides Adding 2ml of HCl to 1ml of the	Formation of colorless gas with the smell	Absence of rotten egg smell.	

	test sample and the mixture is warmed.	of rotten egg indicates the presence of sulfides.		Negative
5.	Test for phosphates Adding 2ml of ammonium molybdate solution to 2ml of the test solution, followed by 2 ml of concentrated nitric acid.	Formation of yellow precipitate indicates the presence of phosphates.	Absence of yellow precipitate.	Negative
6.	Test for Fluoride and Oxalate Adding 2ml of dilute acetic acid and 2ml of calcium chloride solution to 2ml of the test solution.	Formation of white precipitate Indicates the presence of fluoride/oxalate.	Absence of white precipitate.	Negative
7.	Test for Borates Adding 2 ml of the test solution to sulphuric acid and 95% alcohol, then exposed to flame	Appearance of green flame indicates the presence of borates.	Absence of green flame.	Negative
8.	Test for Nitrates Heating 0.5ml of the test solution with copper turnings and add sulphuric acid.	Appearance of reddish-brown gas indicates the presence of nitrates.	Absence of reddish brown colour.	Negative

Analytical Investigation on Test for Basic Radicals

S.No	Test for Specific Basic Radical	Indication / Observation	Inference	Results
1.	Test for Lead Adding 2ml of potassium chromate solution to 1ml of the test solution.	Formation of yellow precipitate indicates the presence of lead.	Absence of yellow precipitate	Negative
2.	Test for Arsenic Adding 2ml of 10% (2N) sodium hydroxide solution to 1ml of the test solution.	Formation of brownish red precipitate indicates the presence of arsenic	Absence of brownish red precipitate	Negative
3.	Test for Mercury 1ml of the test solution added with 2ml of 10% (2N) sodium hydroxide (NaOH) solution.	Formation of yellow precipitate indicates the presence of mercury.	Absence of yellow precipitate	Negative
4.	Test for Copper Adding 1ml of ammonium hydroxide solution to 1ml of the test solution.	Formation of blue precipitate indicates the presence of copper.	Absence of blue precipitate	Negative
5.	Test for Ferric Adding 2ml of potassium ferrocyanide solution to 1ml of the test solution.	Formation of blue precipitate indicates the presence of ferric.	Absence of blue precipitate	Negative
6.	Test for Ferrous Adding 1ml of potassium ferricyanide solution to 1ml of the test solution.	Formation of blue precipitate indicates the presence of ferrous.	Absence of blue precipitate	Negative
7.	Test for Zinc Adding 2ml of sodium hydroxide solution drop-wise to 1ml of the test solution	Formation of white precipitate indicates the presence of zinc.	Absence of white precipitate	Negative
8.	Test for Silver	Formation of curdy white	Absence of curdy	

	Adding 1ml of concentrated HCl to 1ml of the test solution. It is followed by appearance of curdy white precipitate. Boil the precipitate with water. It does not dissolve. Add NH ₄ OH solution in it and add 1 ml dilute HNO ₃ .	precipitate indicates the presence of silver.	white precipitate	Negative
9.	Test for Magnesium Adding 2ml of sodium hydroxide solution drop-wise to 1ml of the test solution	Formation of white precipitate indicates the presence of magnesium.	Absence of white precipitate	Negative

RESULTS AND DISCUSSION

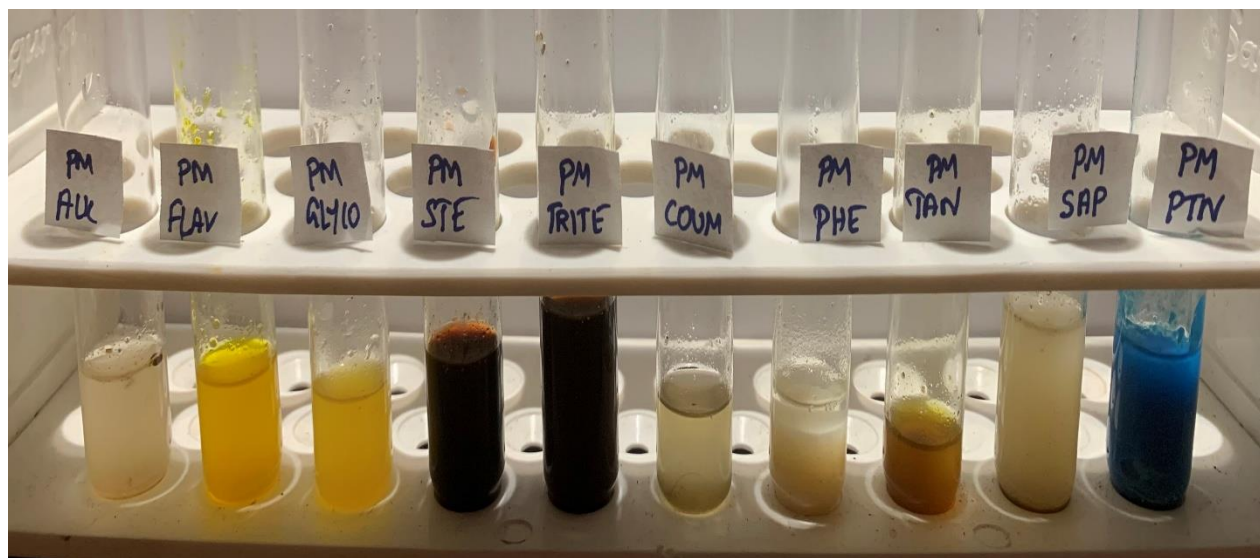


Fig.1: Preliminary phytochemical screening of *Pudhina Maathirai* showing the presence of alkaloids, flavonoids, steroids, phenols, sugar, tannins and triterpenoids

Analytical evaluation revealed the presence of alkaloids, flavonoids, steroids, phenols, sugar, tannins and triterpenoids as shown in Fig.1. Biochemical analysis revealed the presence of chlorides.

Flavonoids and phenolic compounds possess significant antioxidant, anti-inflammatory, and gastroprotective activities, which help reduce gastric mucosal irritation and improve digestive function. These compounds also regulate intestinal motility and secretion, thereby aiding in the management of diarrhoea and vomiting [2].

Alkaloids exhibit antiemetic, antispasmodic, and antimicrobial properties, which help reduce nausea, control vomiting, and relieve intestinal spasms. These effects contribute to the normalization of gastrointestinal motility [3].

Tannins play a vital role in the management of diarrhoea due to their astringent action, which leads to protein precipitation on the intestinal mucosa, forming a protective layer and reducing intestinal secretion. This results in decreased stool frequency and improved stool consistency [4].

Triterpenoids and steroids contribute to anti-inflammatory and mucosal protective effects, promoting healing of the gastrointestinal lining and

reducing irritation associated with indigestion and vomiting[5].

Sugars present in the formulation may provide nutritional support and energy, which is beneficial during gastrointestinal disturbances, especially in diarrhoeal conditions.

Biochemical analysis revealed the presence of chlorides, which are essential for maintaining electrolyte balance and gastric acid secretion. During diarrhoea, electrolyte imbalance is common. Thus, the presence of chlorides may help restore electrolyte homeostasis and support normal digestive processes[7].

Other acid radicals such as carbonate, sulphide, phosphate, fluoride, oxalate, borate and nitrate were absent. Also the basic radical analysis showed the absence of heavy metals including lead, arsenic, mercury, copper, iron, zinc, silver and magnesium, indicating the safety and non-toxic nature of the formulation.

Overall, the presence of diverse phytochemical and biochemical constituents suggests multiple mechanisms of action, including anti-secretory, anti-motility, anti-inflammatory, and antimicrobial effects. These findings support the potential role of *Pudhina*

Maathirai in the management of gastrointestinal disorders such as vomiting, indigestion, and diarrhoea.

CONCLUSION

The present study demonstrates that *Pudhina Maathirai* contains significant phytochemical constituents such as alkaloids, flavonoids, tannins, phenols, steroids, and triterpenoids. Also, it demonstrates a favorable biochemical profile with the presence of essential chloride ions and absence of toxic heavy metals, supporting its safety and therapeutic relevance. These constituents may contribute to its therapeutic effects in the management of vomiting, indigestion, and diarrhoea. The findings provide a scientific basis for its traditional use in Siddha medicine. However, further pharmacological and clinical studies are necessary to establish its efficacy and safety.

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