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Preliminary Phytochemical Evaluation of *Thirikadugu Mathirai* - A Siddha Herbo-Mineral Formulation

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ABSTRACT

Background: Traditional Siddha formulations are widely used for the management of various diseases due to their therapeutic efficacy and minimal side effects. Thirikadugu Mathirai is a classical Siddha herbo-mineral formulation indicated for the treatment of suram (fever) and adhisara sannipadha suram (fever associated with diarrhoea). This paper evaluated the preliminary phytochemical constituents of Thirikadugu Mathirai and provide a scientific basis for its traditional use.

Materials and Methods: Thirikadugu Mathirai was prepared according to standard Siddha procedures using purified karpoora silasathu, *Coccinia grandis*, *Zingiber officinale*, *Piper nigrum*, and *Piper longum*. Preliminary phytochemical screening was carried out using standard qualitative tests based on colour reactions and precipitation methods to identify major classes of phytoconstituents.

Results: The phytochemical analysis revealed the presence of alkaloids, flavonoids, glycosides, steroids, triterpenoids, phenols, tannins, and saponins. Coumarins and proteins were found to be absent. The presence of diverse bioactive constituents supports the traditional therapeutic use of Thirikadugu Mathirai in the management of fever and associated gastrointestinal disorders. Further studies involving quantitative analysis and pharmacological validation are recommended to establish its efficacy and safety.

Keywords: Thirikadugu Mathirai, Siddha medicine, phytochemical analysis, herbo-mineral formulation, Adhisara sannipadha suram, Suram

INTRODUCTION

Natural pharmaceuticals are of great interest at present. So, they are regarded as green medicine. [(1)] The siddha system of medicine is credited with having well optimized methodology and guidelines for developing a number of formulations, including monoherbal, poly herbal, herbo-mineral medications. [(2)] Due to potential therapeutic benefits of the traditional healthcare system, public trust in it has been steadily increasing in recent years. The number and quality of chemical components impact the therapeutic effectiveness of plant-based medications. The American Society for Pharmacognosy defines pharmacognosy as “the study of the physical, chemical, biochemical, and biological properties of drugs, drug substances, or potential drugs or drug substances of natural origin, and the search for new drugs from natural sources”. [(3)] It includes standardization authentication and

study of natural drugs. One of the important recognized studies is the phytochemical analysis. [1] Phytochemicals are non-nutritive plant compound with protective or defensive qualities. Consuming phytochemicals may improve health by protecting against long-term degenerative disorders such as cancer, cardiovascular and neurological diseases. It acts as an anti-oxidant, anti-bacterial, anti-fungal anti-inflammatory, anti-allergic anti-spasmodic chemoprotective, hepatoprotective, diuretic, protects from UV induced carcinogenesis and immune modulator. [4] The most important phytochemicals are the alkaloids, flavonoids, coumarins, tannins, anthraquinones, lignans, saponins, etc,. [5] Thirikadugu mathirai is a Herbo-mineral drug in siddha system of medicine prepared from *Zingiber officinale, Piper nigrum, Piper longum, Coccinia grandis* and *Calcium sulfate dihydrate* – Gypsum. It is indicated for suram (Fever) and adhisara sannipadha suram (Fever associated with diarrhoea) as described in Siddha literature. [6] Despite its widespread traditional use, there is limited scientific evidence regarding its phytochemical composition. The screening is in accordance with PLIM guidelines for quality control manual for ASU drugs. [7] Hence, this study aims to evaluate the preliminary phytochemical constituents of Thirikadugu Mathirai to provide a scientific basis for its therapeutic application.

MATERIALS & METHODS:

Preparation of Thirikadugu Mathirai:

Ingredients:

- Purified karpoora silasathu (*Calcium sulfate dihydrate* – Gypsum)
- Kovai elai (*Coccinia grandis*)
- Sukku (*Zingiber officinale*)
- Milagu (*Piper nigrum*)
- Thippili (*Piper longum*)

Silasathu was processed to obtain Silasathu Parpam by triturating it with the leaf extract of *Coccinia grandis* and subjecting it to incineration (Pudam process) as per standard Siddha methods. A total of 280 g of Silasathu Parpam was obtained. The herbal ingredients, namely *Zingiber officinale*, *Piper nigrum*, and *Piper longum*, were taken in equal quantities (35 g each) and finely powdered separately. Each powdered drug was then triturated with fresh leaf extract of *Coccinia grandis* for 2–3 days to obtain a uniform paste. The prepared mass was rolled into pepper-sized tablets (Mathirai), dried and stored.

Dosage: Milagu alavu (50mg) – 1 to 2 mathirai

Indication: Suram, Adhisara sannipadha suram

Reference: Gunapadam thathu jeeva vaguppu, 2009, Pg No: 532

Preliminary Phytochemical Analysis:

The analysis was carried out to identify the presence of major bioactive constituents in Thirikadugu Mathirai. It provides essential information regarding the chemical composition of the formulation and helps to understand its potential therapeutic properties. The analysis was carried out using standard qualitative methods based on color reactions and precipitation tests. These tests are widely employed for the detection of different classes of phytoconstituents such as alkaloids, flavonoids, tannins, phenols, steroids, triterpenoids, glycosides, saponins, proteins, and carbohydrates. All the tests were carried out as per standard pharmacognostical procedures to ensure reliability and reproducibility of results. [8]

Test for Alkaloids (Mayer's Test)

To the test sample, 2 mL of Mayer's reagent was added. The formation of a dull white precipitate indicated the presence of alkaloids.

Test for Coumarins

To the test sample, 1 mL of 10% sodium hydroxide solution was added. The appearance of yellow coloration indicated the presence of coumarins.

Test for Saponins (Foam Test)

To the test sample, 5 mL of distilled water was added and shaken vigorously. Persistent

froth formation indicated the presence of saponins.

Test for Tannins (Ferric Chloride Test)
To the test sample, a few drops of ferric chloride solution were added. Formation of dark blue or greenish-black coloration indicated the presence of tannins.

Test for Glycosides (Borntrager's Test)
The test sample was hydrolysed with concentrated hydrochloric acid for 2 hours on a water bath and filtered. To 2 mL of filtrate, 3 mL of chloroform was added and shaken. The chloroform layer was separated, and 10% ammonia solution was added. A pink coloration indicated the presence of glycosides.

Test for Flavonoids (Alkaline Reagent Test)
To 2 mL of extract, 2–3 drops of sodium hydroxide were added, producing a deep yellow colour, which turned colourless upon addition of dilute hydrochloric acid, confirming the presence of flavonoids.

Test for Phenols (Lead Acetate Test)
To the test sample, 3 mL of 10% lead acetate solution was added. Formation of a bulky white precipitate indicated the presence of phenolic compounds.

Test for Steroids
To the test sample, 2 mL of chloroform and a few drops of concentrated sulphuric acid were added. The appearance of a red upper layer and yellow-green fluorescence in the acid layer indicated the presence of steroids.

Test for Triterpenoids (Liebermann–Burchard Test)
To the chloroform extract, a few drops of acetic anhydride were added followed by concentrated sulphuric acid along the side of the test tube. Formation of a reddish ring indicated the presence of triterpenoids.

Test for Proteins (Biuret Test)
To the extract, 1% copper sulphate solution followed by 5% sodium hydroxide was added. Formation of violet or purple colour indicated the presence of proteins.

RESULT

The preliminary phytochemical screening of Thirikadugu Mathirai demonstrated the presence of several important bioactive constituents. Alkaloids were found to be present, indicating potential pharmacological activity. Flavonoids and phenolic compounds were also detected. The analysis further confirmed the presence of glycosides, steroids, and triterpenoids, which are known to contribute to various therapeutic effects. Tannins and Saponins were also present, which may enhance the bioavailability. On the other hand, coumarins and proteins were found to be absent in the formulation. Overall, the presence of diverse phytoconstituents in Thirikadugu Mathirai indicates its potential for multiple pharmacological actions, thereby supporting its traditional use.

S.NO	PHYTOCHEMICAL	OBSERVATION
1	Alkaloids	+
2	Flavonoids	+
3	Glycosides	+
4	Steroids	+
5	Triterpenoids	+
6	Coumarin	-
7	Phenol	+
8	Tannins	+
9	Saponins	+
10	Proteins	-

DISCUSSION

The present study revealed that Thirikadu mathirai, a herbo-mineral preparation indicated for Suram, Adhisara sannipadha suram contains a wide range of phytoconstituents including alkaloids, flavonoids, glycosides, steroids, triterpenoids, phenols, tannins and saponins. The therapeutic potential of Thirikadugu mathirai can be attributed to its individual ingredients. Piperine is the major bioactive component in *Piper nigrum* (black pepper) and its displays various therapeutic benefits including antiplatelet, antihypertensive, anticancer, antioxidant, analgesic, antidepressants and anti-diarrheal. Phenolic compounds obtained from fresh black pepper seed extracts have the potential to inhibit the growth of *Bacillus, Escherichia coli* and *Staphylococcus aureus*, *S. faecalis.* [9] The alkaloids, lignans and esters of *Piper longum* has showed promising activities like immunomodulatory, anti-amoebic, antipyretic and anti-inflammatory etc. [10] The phytochemical like gingerols, 1,7-bis-(40-Hydroxy-30-methoxyphenyl)-3,5-heptadione, adenine present in dried *Zingiber officinale* possess antibacterial, anti- pyretic, anti-inflammatory, anti-diarrhoea activity, hepatoprotective analgesic, anthelmintic activity. [11] The leaves of *Coccinia grandis* reported to have anti-diabetic, anti-inflammatory, antipyretic, analgesic, antispasmodic and anti-microbial activities. [12] Thus, the presence of these phytoconstituents and the synergistic action of the individual ingredients provide a scientific rationale for the traditional use of Thirikadugu Mathirai in the treatment of fever and associated gastrointestinal disturbances. However, further studies involving quantitative phytochemical analysis, instrumental characterization, and pharmacological evaluation are required to substantiate these findings.

CONCLUSION

The present study on the preliminary phytochemical analysis of Thirikadugu Mathirai revealed the presence of important bioactive constituents such as alkaloids, flavonoids, glycosides, steroids, triterpenoids, phenols, tannins, and saponins. These phytoconstituents are known for their diverse pharmacological activities, including antipyretic, anti-inflammatory, antimicrobial, and anti-diarrhoeal effects. The findings of this study provide a scientific basis for the traditional use of Thirikadugu Mathirai in the management of suram (fever) and adhisara sannipadha suram (fever associated with diarrhoea). The synergistic action of the herbal and mineral components may contribute to its therapeutic efficacy. Future research focusing on quantitative analysis, bioactive compound isolation, and clinical validation is warranted to further establish its efficacy and safety.

Declaration by Authors
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