



PRELIMINARY PHYSICOCHEMICAL AND HEAVY METAL ANALYSIS OF SIDDHA HERBO MINERAL DRUG *SITHAANANTHA BAIRAVA MATHIRAI*

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ABSTRACT

Sithaanantha bairava mathirai (SBM) is a traditional Siddha medicinal preparation to treat *Thandaga vatham* (Lumbar spondylosis) narrated in the text in the Siddha classical text *Koshayi Anuboga vaithya Bramma Ragasiyam Part-2*. This formulation has the detoxified ingredients such as *Lingam* (Cinnabar), *Vengaaram* (borax), *Naabi* (*Aconitum ferox*), *Sukku* (*Zingiber officinale*), *Valmilagu* (*Piper nigrum*), *Thippili* (*Piper longum*), *Perungayam* (*Ferula asafoetida*) and *Elumicchai* (*Citrus limon*). The aim of the present study was to ensure the quality and safety of *Sithaanantha bairava mathirai* (SBM). Preliminary phytochemical, Physicochemical characterization of the study drug was carried out using qualitative analysis and inductively coupled plasma analysis according to the standard methods as prescribed in PLIM guidelines. Trace elemental analysis of *Sithaanantha bairava mathirai* (SBM) revealed that heavy metals like arsenic, cadmium, mercury and lead were below the detectable limit. Further, elemental analysis revealed the presence of minerals like calcium, iron, potassium, sodium, and phosphorus under acceptable limits at the prescribed dose of *Sithaanantha bairava mathirai*. The particle per million size of *Sithaanantha bairava mathirai* was found to be 10micrometer.

KEYWORDS: *Sithaanantha bairava mathirai*, Physicochemical traits, Siddha medicine, mineral drug, Lumbar spondylosis.

INTRODUCTION

Siddha system is an oldest holistic system of medicine with meticulously documented formulations that incorporates the wide usage of heavy metals and minerals for curing chronic illness. It is being practiced by a large population in south India. WHO has also recognized Indian system of medicine as an effective alternative medicine in the place of conventional allopathic system of medicine. Although the herbomineral formulations are clinically effective, the Siddha system, is presently being accused of its appreciation and Indian system of medicine are being condemned to market the drugs reporting the presence of heavy metals like Lead, Cadmium, Arsenic and Mercury. Hence the development of this traditional system of medicines with perspectives of safety, efficacy and quality would not only to support to preserve the traditional heritage but also to rationalize the use of natural products in health care.^[1,2] The Department of AYUSH, Govt. of India has also made valuable effort in overcoming this issue and strongly emphasise the Siddha researchers to do characterization and toxicological studies in for proving the safety of the traditional drugs. In view of this issue, we validated the safety and efficacy of a Siddha pill "*Sithaanantha bairava mathirai*" which

is indicated for Lumbar spondylosis by analyzing the Phytochemical and physico-chemical properties and elemental and particle size analysis and the results have been documented and analyzed thereby to initiate a preliminary effort for scientific validation.

PREPARATION OF SITHAANANTHA BAIRAVA MATHIRAI

The ingredients of SBM consist of *Lingam* (Cinnabar), *Vengaaram* (borax), *Naabi* (*Aconitum ferox*), *Sukku* (*Zingiber officinale*), *Valmilagu* (*Piper nigrum*), *Thippili* (*Piper longum*), *Perungayam* (*Ferula asafoetida*) and *Elumicchai* (*Citrus limon*). Prior to the preparation of SBM, *Linga kattu* was prepared by placing the Purified *Serangottai* (1050 gms) (*Semicarpus anacardium*) inside a clay pot and Cinnabar (70 gm) was placed in the centre of it and was covered with the remaining Purified *Serangottai* (*Semicarpus anacardium*) and the vessel was subjected to heat. After the *Serangottai* was completely burnt, the *Linga kattu* was taken out and used for the preparation of SBM. All the ingredients including the prepared *Linga kattu* were taken in equal quantity (35 gms) and were grinded using lemon juice in a stone mortar until pill rolling consistency and the pills were made in the size of 130mg (*Kuntrimani alavu*).^[3]

PHYSICOCHEMICAL ANALYSIS OF SBM

Procedures

SBM was subjected for the determination of physicochemical parameters and limit tests for heavy metal contents according to the standard methods described in "The Ayurvedic Pharmacopoeia of India". The presence or absence of different phytoconstituents viz, triterpenoids, alkaloids, steroids, sugar, tannin, glycosides and flavonoids etc. were detected by usual prescribed methods.^[4]

Preparation of extract for preliminary basic and acidic radicals studies

The sample was subjected for qualitative analyses of cations and anions based on Asokan (2001) and Sofowora (1996). 5g of each sample was taken in a 250 ml of clean beaker and 50 ml of distilled water was added to it. Then, it was boiled well for about 10 min and allowed to cool and filtered in a 100 ml volumetric flask and made up to 100 ml with distilled water and used for the study.

Inductively coupled plasma optical emission spectrometry (ICP-OES) study

The experimental procedure was done at SAIF, IIT Madras, Chennai – 36 using Perkin Elmer Optima 5300

DV. The sample preparation for metal analyses was done by microwave digestion method (Charles, 1997). A 0.25 g of test sample was transferred into a liner provided with the instrument. To this, 9 ml of Nitric acid was added and mixed thoroughly and allowed reacting for few minutes. Then, the liner was placed in the vessel jacket and the vessel was sealed and placed in the rotor and fixed in microwave. The vessel was heated up to 180°C for 5 minutes and held at 180°C for 10 minutes. The vessel was allowed to cool down below 60°C of vessel interior temperature and below 50°C of a vessel surface temperature and rotor was removed. The digested sample was made up to 100ml with millipore water. If visible insoluble particles exist, solution could be filtered through whatmann filter paper. The digested solution was transferred into plastic containers and properly labeled.

RESULT

Basic radical test

The composition of the *Sithaanantha bairava mathirai* was tested for basic radicals like lead, copper, aluminium, iron, zinc, calcium, magnesium and ammonium and confirmed the absence of lead, copper zinc, magnesium by various reagent tests. The details are given in the table 1.

Table 1: Test for basic radicals.

S. No	Reagents used	Observations	Inference
1.	Test For Lead	No Yellow Precipitate is obtained.	Absence of Lead
2.	Test For Copper	No Blue colour flame No Blue colour precipitate formed.	Absence of copper
3.	Test For Aluminium	Yellow colour appeared	Presence of aluminium
4.	Test For Iron	Mild red colour appear	Presence of Iron
5.	Test For Zinc	White precipitate is not formed	Absence of Zinc
6.	Test For Calcium	Cloudy appearance and white precipitate is obtained	Presence of calcium
7.	Test For Magnesium	White precipitate is obtained	Presence of Magnesium
8.	Test For Ammonium	No Brown colour appeared	Absence of ammonium

Acid radical test

The herbal formulation of *Sithaanantha bairava mathirai* was tested for acid radicals by performing various tests

and the absence and the presences of acid radical based on the observation. The details are given in the table 2.

Table-2: Test for acidic radicals.

S. No	Reagents used	Observations	Inference
1.	Test For Sulphate	No Cloudy appearance present	Absence of Sulphate
2.	Test For Chloride	cloudy appearance present	Presence of Chloride
3.	Test For Phosphate	Mild Yellow appearance present	Presence of Phosphate
4.	Test For Carbonate	Presence of Cloudy appearance	Presence of carbonate
5.	Test For Nitrate	No Brown gas is evolved	Absence of Nitrate
6.	Test For Sulphide	No Rotten Egg Smelling gas evolved	Absence of Sulphide
7.	Test For Fluoride & Oxalate	No Cloudy appearance	Absence of fluoride and oxalate
8.	Test For Nitrite	No Characteristic changes	Absence of Nitrite
9.	Test For Borate	Bluish green colour flame not appeared	Absence of borate

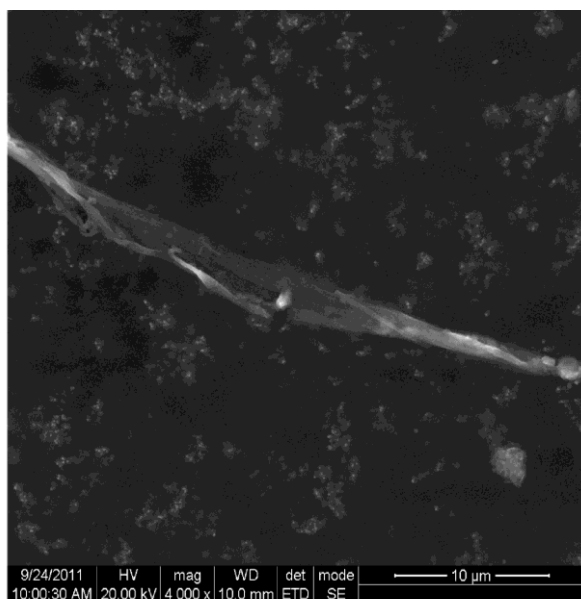
Heavy metal analysis – ICP-OES

Heavy metal analysis is very important and crucial part of the study it will validate the presence or absence of the heavy metals like lead, cadmium, copper, mercury, iron

and so on. The details of the analyte and the mean value are given in the table 3.

Table-3: ICP-OES analysis.

S. No	Analyte	Mean
1.	Al 308.215	1.00mg/L
2.	As 193.696	Below the Detectable Limit
3.	Ca 317.933	15.645 mg/L
4.	Cd 226.502	Below the Detectable Limit
5.	Hg 253.652	Below the Detectable Limit
6.	Fe 238.204	18.356 mg/L
7.	Mg 279.079	7.015 mg/L
8.	Na 589.592	19.232 mg/L
9	P 213.617	16.583 mg/L
10.	Pb 230.204	Below the Detectable Limit
11.	Si 288.158	0.753 mg/L

Figure-1: Particle per million size of *Sithaanthabairava mathirai* (10 micron).

DISCUSSION

Spondylosis and spondylolisthesis are often asymptomatic and rarely symptomatic, may also cause back pain, instability, and radiculopathy that require treatment. Spondylolysis is a unilateral or bilateral bony defect in the pars interarticularis (or isthmus) in the vertebra and it involves the L5 vertebra (95% of cases).^[5] In Siddha medicine *Sithaanthabairava Mathirai* is a polyherbal formulation used for the treatment of Thandaga vatham (lumbar spondylosis). While observing the physical characteristic of the herbal formulation *Sithaanthabairava Mathirai* it was observed that the tablets possess a cinnamon red to a brick red with a crystal structure and a hardness ranging from 2-2.5. The biochemical characteristic indicated the presence of silicate, Carbonate, Sodium and absence of copper. The formulation was tested for the presence of acid radicals and revealed that presence of Chloride, Phosphate, carbonate and absence of Sulphate, Nitrate, Sulphide, fluoride and oxalate, Nitrite and Borate. The acute oral fluoride intoxication in human causes severe nausea, vomiting, hypersalivation, abdominal pain, and diarrhea.^[6] The intake of oxalate may cause kidney stone

since it get poorly absorbed and the free oxalate combine with calcium to form calcium oxalate precipitate.^[7] Similarly Nitrate is a hazard substance to health because it gets converted into nitrite. The nitrate gets converted into nitrite in the presence of saliva for all age groups and for infants in the gastrointestinal tract. So in this Siddha formulation the absence of fluoride and oxalate serve to be very useful with no adverse reactions.

The lead compounds with various bimolecular structures adversely affect the organ functions. Exposure to lead can cause various adverse effects on the human body systems like blood, nervous, immune, renal, skeletal, muscular, reproductive, and cardiovascular causing poor muscle coordination, gastrointestinal symptoms, brain and kidneys damage, hearing and vision impairments, and reproductive defects.^[8,9] But it is fortunate that our herbal formulation has no detectable amount of lead which was confirmed by ICP-OES analysis. Similarly cadmium intake can cause serious effects on the liver and vascular and immune system^[10] and in our Siddha formulation it was seen in negligible amount which was within the permissible limits. So while looking into the ICP-OES analysis study it was observed that many of the harmful heavy metals were all below the detectable level.

CONCLUSION

In conclusion, *Sithaanthabairava Mathirai* has been evaluated for its physical, chemical and heavy metal analysis study and it is being used in Siddha medicine as a potential tablet for Lumbar spondylosis. All the analysis had proved the various properties of the herbal formulation. The absence of various toxic chemical and heavy metals have made this herbal formulation a safe to use one based on the technical aspects. But still future studies are needed to prove its effectiveness and safety on animal models to confirm the traditional claims.

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