Research Article

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ANALYTICAL CHARACTERIZATION OF MAHA VEERA MEZHUGU: A SIDDHA HERBO-MINERAL FORMULATION THROUGH POWDERED X-RAY DIFFRACTION

Shanmugapriyan Pazhani [1]*, Manivannan Periyasami [2], Amarnath Dhanapal [1], Sivakkumar S [3]

[1] PG Scholar, Department of Gunapadam (Siddha pharmacology), National Institute of Siddha (Affiliated with the Tamil Nadu Dr. M. G. R. Medical University), Ministry of Ayush, Chennai, Tamil Nadu, India

[2] PG Scholar, Department of Siddhar Yoga Maruthuvam, National Institute of Siddha (Affiliated with the Tamil Nadu Dr. M. G. R. Medical University), Ministry of Ayush, Chennai, Tamil Nadu, India

[3] Professor, Department of Gunapadam (Siddha pharmacology), National Institute of Siddha (Affiliated with the Tamil Nadu Dr. M. G. R. Medical University), Ministry of Ayush, Chennai, Tamil Nadu, India

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***Corresponding author**
E-mail: shanpriyan100598raiser@gmail.com

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ABSTRACT

Introduction: Maha Veera Mezhugu (MVM) is a Siddha medicine made from red sulphide of mercury, arsenic compounds, minerals, and herbs, and is used for chronic illnesses like Megarogam and Vadharogam. In this study, MVM was prepared as described in traditional Siddha texts and verified by experts. Methodology: Powder X-ray Diffraction (PXRD) was used to study its composition, along with tests for microbes and heavy metals. Result: The results showed no harmful contaminants, and the medicine met safety standards. The X-ray diffraction data indicates a highly crystalline structure with seven distinct peaks. The most intense peak at 30.8787∘ 2θ (100% relative intensity, d = 2.89349 Å) suggests the presence of a dominant phase with well-ordered atomic planes. Peaks at 30.8787∘ 2θ, 26.1863∘ 2θ and 27.8453∘ 2θ show significant intensities (100.00%, 83.33% and 28.01% respectively). Discussion and conclusion: This confirms the purity and safety of MVM and shows that PXRD is useful for checking the quality of Siddha medicines. The main peaks suggest the presence of Cinnabar (Red mercury sulphide). This shows how traditional medicine, like alchemy, relies on careful preparation and specific ingredients to create powerful combinations. The findings can serve as a reference for quality control and standardization of Maha Veera Mezhugu.

Keywords: Maha Veera Mezhugu, Siddha medicine, PXRD, safety, quality control.

INTRODUCTION

Maha Veera Mezhugu (MVM) is a traditional herbo-mineral preparation used in Siddha medicine, an ancient healing system that originated in Tamil Nadu, India. It is prescribed for a range of "Vadha" disorders, which include conditions such as pain, inflammatory ailments, paralysis, and neurological issues. The formulation is also employed in treating "Mega" disorders, encompassing venereal diseases and diabetes.[1]

Its composition is distinct, consisting of a combination of five medicinal herbs, three metallic ingredients, one animal-derived substance, and one mineral component. This paper seeks to examine the medicinal value, constituents, and potential modes of action of Maha Veera Mezhugu in managing these conditions within the principles of the Siddha medical system. Siddha literature, including ancient texts and manuscripts, details various treatments and their efficacy.

The text Siddha Vaithiya Thirattu by Dr. K. N. Kuppusamy Mudhaliyar and K. S. Uthamarayan mentions a potent medicine called Maha Veera Mezhugu. The study specifically aims to scientifically validate the herbo-mineral formulation Maha Veera Mezhugu (MVM), which currently lacks quality assurance and safety verification despite its traditional uses.[2]

Powder X-ray diffraction (PXRD) was utilized in the study to analyze the presence of metallic elements and structural properties, contributing to the safety and quality evaluation of traditional Siddha medicines. As certain pharmaceuticals are marketing the drug MVM without sufficient evidence of safety and quality assurance, there is a pressing need to assess the quality of both its ingredients and the final product.

MATERIALS AND METHODS

Source of the test drug

The test drug "Maha Veera Mezhugu" is one of the Herbo-mineral formulations treated for Vadha and Mega diseases which is indicated in the Siddha literature "Siddha Vaithiya Thirattu" written by Dr. K. N. Kuppusamy mudhaliyar and K. S. Uthamarayan.

Collection and Authentication

All the raw drugs were purchased in local market in Chennai and a raw drug store in Erode and authenticated by the "Department of Gunapadam, National Institute of Siddha, Chennai" (certified No. NISMB7932025, GUN/AUT/08/24).

Ingredients of the drug

Ingredients of the drug was described in Table 1.

Table 1: Ingredients of Maha Veera Mezhugu

Vernacular name	Botanical/Chemical name	Quantity
Purified Lingam	Red sulphide of mercury	35g
Purified Veeram	Perchloride of mercury	35g
Purified Pooram	Subchloride of mercury	35g
Chukku	*Zingiber officinale*	35g
Milagu	*Piper nigrum*	35g
Thippili	*Piper longum*	35g
Chithiramoolam verpattai	*Plumbago zeylanica*	210g
Kunguma poo	*Crocus sativas*	4.2g
Korosanai	Ox bile	4.2g
Pachai karpooram	Borneo camphor	4.2g
Honey		Required amount
Milk		Required amount

Preparation of drug

First, purify the Veeram with the juice of Moringa bark until it is completely blended. After that, grind the ingredients Veeram, Lingam, Pooram, Thirikadugu, and Chithiramoolam with honey and milk. Finally, add Kunguma Poo, Korosanai, and Pachai Karpooram to the mixture and grind them well until it reaches a Mezhugu (semisolid/wax-like) consistency. Store the prepared medicine in an airtight container.

Powder X-Ray Diffraction (PXRD)

Methodology: Powder diffraction data were collected using an Aeris PANalytical diffractometer (Netherlands) with Ni-filtered copper radiation in Bragg-Brentano geometry. A fine powder sample was spread as a thin layer on a silicon zero-background holder. The sample was scanned for the angle 2θ in the range of 10–90° at a scanning rate of 4°/sec using Cu Kα radiation (λ = 1.5418 Å). The powder X-ray diffraction (XRD) analysis of the drug MVM was performed using a gonio scan axis in continuous scan mode, covering a 2θ range from 7.0129° to 89.9749°, with a step size of 0.0220° and a scan step time of 90.270 s. The measurement was carried out at a controlled temperature of 25°C to ensure the stability of the drug during analysis. Data collection utilized a fixed divergence slit (0.4584°) for precise control of the incident beam, with a specimen length of 10 mm and a goniometer radius of 145 mm. A copper (Cu) anode was used as the X-ray source, providing characteristic K-Alpha1 (λ = 1.54060 Å), K-Alpha2 (λ = 1.54443 Å), and K-Beta (λ = 1.39225 Å) wavelengths, with a K-A2/K-A1 intensity ratio of 0.5. The generator was operated at 8 mA and 40 kV to ensure optimal intensity and resolution. The diffractometer, model 348709, was operated in scanning PSD mode with a PSD length of 5.54° 2θ, an offset of 0.0000° 2θ, and a distance from focus to divergence slit of 95 mm. The absence of an incident beam monochromatic and specimen spinning was noted, aligning with standard powder XRD protocols for crystalline characterization. The raw data were acquired in XRD measurement (*. XRDML) format for subsequent phase identification and structural analysis.[5,6]

RESULTS AND DISCUSSION

X-ray diffraction analysis (XRD) is a non-destructive technique that provides detailed information about the crystallographic structure, chemical composition, and physical properties of a material. The X-ray diffraction data indicate a highly crystalline structure with seven distinct peaks. The most intense peak at 30.8787° 2θ (100% relative intensity, d = 2.89349 Å) suggests the presence of a dominant phase with well-ordered atomic planes. Peaks at 30.8787° 2θ, 26.1863° 2θ, and 27.8453° 2θ show significant intensities (100.00%, 83.33%, and 28.01%, respectively), indicating secondary phases or additional crystalline planes contributing to the structure. The narrow FWHM (Full Width at Half Maximum) values across the peaks reflect good crystallinity, although minor broadening suggests the presence of small crystallites or slight structural disorder in certain regions. The varying d-spacing values (1.30998–3.40036 Å) suggest a mixture of closely packed and more open planes, indicating a complex material with diverse atomic arrangements.[6-8] The main peaks suggest the presence of cinnabar (red mercury sulphide). This demonstrates how traditional medicines, similar to alchemical practices, rely on careful preparation and specific ingredients to produce potent combinations. Although cinnabar may not form immediately, traditional methods often allow slow chemical transformations over time. The combination of metals, minerals, and herbs may lead to the formation of unique compounds under certain conditions, such as aging or environmental exposure. In Siddha medicine, formulations containing cinnabar are traditionally used to treat conditions such as tumours, tuberculosis, fever, goitre, skin disorders, and nervous system ailments.[9]

PXRD Graph:

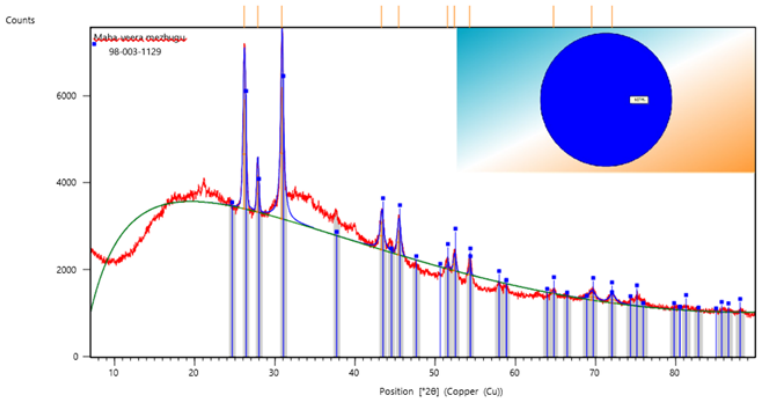

Figure 1: PXRD (Powder X Ray Diffraction) Graph

Pos. [°2θ]	Height [cts]	FWHM Left [°2θ]	d-spacing [Å]	Rel. Int. [%]
26.1863	2520.94	0.4192	3.40036	83.33
27.8453	847.22	0.3277	3.20142	28.01
30.8787	3025.23	0.3936	2.89349	100.00
43.3024	641.81	0.5036	2.08778	21.22
45.4495	567.29	0.5277	1.99402	18.75
51.5481	273.42	0.0791	1.77152	9.04
52.3898	288.04	0.3808	1.74502	9.52
54.2709	447.13	0.0947	1.68890	14.78
64.7391	78.07	0.0793	1.43880	2.58
69.5114	147.92	0.9678	1.35122	4.89
72.0335	159.10	0.7760	1.30998	5.26

(a)

Visible	Ref. Code	Score	Compound Name	Displ. [°2θ]	Scale Fac.	Chem. Formula
*	98-003-1129	51	Cinnabar	0.000	0.425	Hg1S1

(b)

Figure 2: Powder XRD (a) Peak list, (b) Pattern list

CONCLUSION

The research on Maha Veera Mezhugu (MVM) demonstrates compliance with traditional Siddha methods and quality standards. The results support the effectiveness and safety of MVM, providing a strong foundation for its application in traditional medicine. This also paves the way for further studies on its pharmacological uses. Furthermore, this study can serve as a reference for the future development of a monograph on Maha Veera Mezhugu.

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