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PHYSICOCHEMICAL ANALYSIS IN STANDARDIZATION OF SIDDHA HERBO MINERAL DRUG AJAMOTHASTAKA MAATHIRAI (AM)

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Abstract: **Introduction:** Gastrointestinal conditions will benefit from the use of this medication. Drug standardization and publication are seen as the keys to spreading authenticity in today's globalized society. AM was standardized using PLIM criteria, which were crucial to the process of Occidentalizing. **Material and methods:** AM was made in accordance with GMP regulations. Physico-chemical analysis, HPTLC, TLC investigation, and the finding of organoleptic qualities are all part of drug standardization. The investigation was conducted at Noble Research Solution's facility in accordance with PLIM criteria**. Results:** Research findings indicate there are nine peaks in the HPTLC screening graphic. Other characteristics include loss of drying (2.93 %), total ash value (1.16%), acid insoluble ash (0.0%), water soluble extraction (18.33 %), alcohol soluble extraction (8.8 %), and pH (7.10) which is neutral. **Conclusion:** Future clinical research and standardization would benefit from the published data. **Key word:** Ajamothastaka maathirai (AM), Acid peptic disease (APD), Gastrointestinal, pharmacopeial laboratory for Indian medicine (PLIM), Nobel research institute, High Performance thin layer chromatography (HPTLC).

Index Terms – **Ajamothastaka maathirai(AM),Acid peptic disease (APD), HPTLC, PLIM.**

INTRODUCTION

Developed in the Indian subcontinent, the Siddha system of medicine stands as one of the enduring healthcare traditions, having been enshrined in ancient texts. The basic concept of Siddha remains a system that puts equal emphasis on the mind, body and spirit[1]. It works towards restoring this equilibrium after a person has fallen ill. The practice of Siddha is guided by a series of do's and don'ts, also known as pathiam and apathiam. Siddha views disease as a condition caused when the normal equilibrium of the three humors (collectively called mukkuttram) – vaadham (airy), pittham (fiery) and kapam (watery) – is disturbed. The factors assumed to affect this equilibrium are environment, climatic conditions, diet, physical activities, and stress. Under normal conditions, the ratio between Vaadham, Pittham, and Kapam are 4:2:1, respectively . The science of medicine is of fundamental importance to man’s well being be and his survival and so it must have originated with man and

developed as civilization. It is, therefore rather pointless to try to determine the exact point of time to which the beginning of these systems could be traced They are eternal, they began with man and may end with him. The fundamentals and principles largely rely upon 5 element theory, taste and three humours . Thriving under government support as one of the recognized Ayush systems, Siddha medicine serves a significant portion of the population through both public and private healthcare facilities. Its rich history is evident in the vast collection of herbals, mineral, marine, and metallic medicinal preparations meticulously documented and preserved by its ancient founders. Within this vast array of remedies, Ajamothastaka maathirai[AM], Herbo minerai preparation, has traditionally been used to address gunmam related conditions like acid peptic disease and other gastrointestinal ailments. Recognizing the potential of Siddha medicine in this age of technological advancement, the WHO has endorsed efforts to identify active ingredients and standardize drug studies based on PLIM guidelines. This standardization process not only enhances the legitimacy of Siddha medicine but also serves as a bridge towards wider acceptance. Ajamothastaka maathirai[AM] itself is undergoing thorough evaluation, including assessments of its organoleptic properties, physical characteristics, and composition through qualitative and quantitative analysis.

MATERIAL AND METHODS

The herbo mineral preparation, Ajamothastaka maathirai, was identified in the canonical text "Anuboga Vaithiya Brahmaragasiyam"[2] written by Koshayi swamikal and Munusamy. The ingredients for the formulation are included in table[3-10].

TABLE -1 INGREDIENTS OF AM

INGREDIENTS	BOTANICAL NAME / CHEMICAL NAME	QUANTITY
1.Omam	*Carum copticum*	5 varagan(21 grams)
2.Perungayam	*Ferula asafetida*	5 varagan(21 grams)
3.Kodiveli	*Plumbago indica*	5 varagan(21 grams)
4.Koshtam	*Costus speciosus*	5 varagan(21 grams)
5.Vasambu	*Acorus calamus*	5 varagan(21 grams)
6. Kandubaringi	*Clerodenrum serratum*	5 varagan(21 grams)
7.Indhuppu	*Sodium chloride/Rock salt*	5 varagan(21 grams)
8. Elarisi	*Eletaria cardamomum*	5 varagan(21 grams)

COLLECTION, IDENTIFICATION AND AUTHENTICATION OF THE DRUG

All necessary plant materials were procured from a raw drug shop located at Parry's Corner in Chennai, Tamil Nadu. These materials were subsequently verified and confirmed by botanical (GSMC/MB 656-662)[10] and pharmacological experts at the Government Siddha Medical College Hospital in Arumbakkam, Chennai – 106.

PURIFICATION OF THE DRUGS

All the drugs mentioned here were purified as per the Siddha literature"Sarakkugalin suththi sei muraigal"[12-17].

1. Purification of Omam [Carum copticum]: Omam was soaked in a karsunnambu water and filtered, then dried in a sunlight for 3 hours.

2. Purification of Perungayam [Ferula asafoetida]: Perungayam was fried and triturated in a stone mortar to collect a fine powder.

3. Purification of Kodiveli [Plumbago indica]: All the impurities were removed then washed in water and dried it in a sunlight.

4. Purification of Koshtam [Costus speciosus]: All the impurities were removed then washed in water and dried it in a sunlight.

5. Purification of Vasambu [Acorus calamus]: Turmeric paste was applied over the vasambu and heated in a small flame. Then dried and ground in a stone mortar to collect a fine powder.

6. Purification of Kanduparangi [Clerodendrum serratum]: All the impurities were removed then washed in water and dried it in a sunlight.

7. Purification of Indhuppu [Sodium chloride]: Indhuppu was soaked in a vinegar and filtered then dried it in a sunlight for 3 hours.

8. Purification of Elarisi [Elettaria cardamomum]: Skin was removed and the arisi was collected and it was fried and triturated in a stone mortar to collect a fine powder[12-17].

PREPARATION OF THE DRUG

PROCEDURE:

The purified raw drugs listed in Table 1 were meticulously ground into a fine powder using a mortar and pestle and seived in a fine cloth separately. Then the fine powders were collected. Finally the fine powders were grinded with sufficient amount of water in a stone mortar. At last, the karkam was collected and rolled into pills in the size of kazharchikkaai and allowed to dry. [Kazharchikkaai - 2.6gms]. This tablet, named Ajamothastaka maathirai (AM)[2], was then stored in an airtight container for safekeeping[18].

STANDARDIZATION OF THE DRUG

1. Organoleptic Characters of AM

The Ajamothasataka maathirai appeared to be dark brownish in colour with a characteristic bitter taste and had a characteristic odour[19]. The results were mentioned in the following table.

Table -2 Organoleptic Characters of AM

State	Solid
Nature	Fine powder
Odour	Characteristic
Touch	Soft
Flow Property	Free flowing
Appearance	Dark Brownish

Table -3 Solubility Profile

S.No	Solvent Used	Solubility / Dispersibility
1	Chloroform	Insoluble
2	Ethanol	Soluble
3	Water	Soluble
4	Ethyl acetate	Insoluble
5	DMSO	Soluble

2.PHYSICOCHEMICAL ANALYSIS OF AJAMOTHASTAKA MAATHIRAI (AM)

The preliminary physicochemical screening test was carried out for Ajamothastaka maathirai (AM) as per the standard procedures mentioned here under[20-24]

2.1Percentage Loss on Drying

Test drug was accurately weighed in evaporating dish. The sample was dried at 105^{o}C for 5 hours and then weighed.

2.2Determination of Total Ash

Test drug was accurately weighed in silica dish and incinerated at the furnace a temperature 400^{o}C until it turns white in color which indicates absence of carbon. Percentage of total ash will be calculated with reference to the weight of air-dried drug.

2.3 Determination of Acid Insoluble Ash

The ash obtained by total ash test will be boiled with 25 ml of dilute hydrochloric acid for 6mins. Then the insoluble matter is collected in crucible and will be washed with hot water and ignited to constant weight. Percentage of acid insoluble ash will be calculated with reference to the weight of air-dried ash.

2.4 Determination of Alcohol Soluble Extractive

Test sample was macerated with 100 ml of Alcohol in a closed flask for twenty-four hours, shaking frequently during six hours and allowing it to stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105^{o}C, to constant weight and weigh. Calculate the percentage of alcohol-soluble extractive with reference to the air-dried drug.

2.5 Determination of Water Soluble Extractive

Test sample was macerated with 100 ml of chloroform water in a closed flask for twenty-four hours, shaking frequently during six hours and allowing it to stand and for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105^{o}C, to constant weight and weigh. Calculate the percentage of water-soluble extractive with reference to the air-dried drug.

2.6 pH determination

Required quantity of test sample was admixed with distilled water and the subjected to screening using pH meter.

Table-4 PHYSICOCHEMICAL ANALYSIS OFSIDDHA FORMULATION AJAMOTHASTAKA MAATHIRAI (AM)

S.No	Parameter	Mean (n=3) SD
1.	***Loss on Drying at 105 °C (%)***	2.93 ± 0.2
2.	***Total Ash (%)***	1.16 ± 0.3
3.	***Acid insoluble Ash (%)***	0 ± 0
4.	***Water soluble Extractive (%)***	18.33 ± 3.5
5.	***Alcohol Soluble Extractive (%)***	8.8 ± 1.83
6.	***Ph***	7.10

3.Identification-TLC/HPTLC:

3.1 TLC Analysis:

The test sample was subjected to thin layer chromatography (TLC) as per conventional one-dimensional ascending method using silica gel 60F254, 7X6 cm (Merck) were cut with ordinary household scissors. Plate markings were made with soft pencil. Micro pipettes were used to spot the sample for TLC applied sample volume 10-micro liter by using pipette at distance of 1 cm at 5 tracks. In the twin trough chamber with the specified solvent system After the run plates are dried and was observed using visible light Short-wave UV light 254nm and light long-wave UV light 365 nm

3.2 High Performance Thin Layer Chromatography Analysis

HPTLC method is a modern sophisticated and automated separation technique derived from TLC. Pre-coated HPTLC graded plates and auto sampler were used to achieve precision, sensitive, significant separation both qualitatively and quantitatively. High performance thin layer chromatography (HPTLC) is a valuable quality assessment tool for the evaluation of botanical materials efficiently and cost effectively. HPTLC method offers a high degree of selectivity, sensitivity and rapidity combined with single-step sample preparation. Thus, this method can be conveniently adopted for routine quality control analysis. It

provides chromatographic fingerprint of phyto-chemicals which is suitable for confirming the identity and purity of Phyto therapeutics.

Chromatogram Development

It was carried out in CAMAG Twin Trough chambers. Sample elution was carried out according to the adsorption capability of the component to be analyzed. After elution, plates were taken out of the chamber and dried.

Scanning

Plates were scanned under UV at 366nm. The data obtained from scanning were brought into integration through CAMAG software. Chromatographic fingerprint was developed for the detection of phyto constituents present in each sample and their respective Rf values were tabulated.

Figure -1 TLC Visualization of AM at 366 nm

Figure -2 3D – Chromatogram

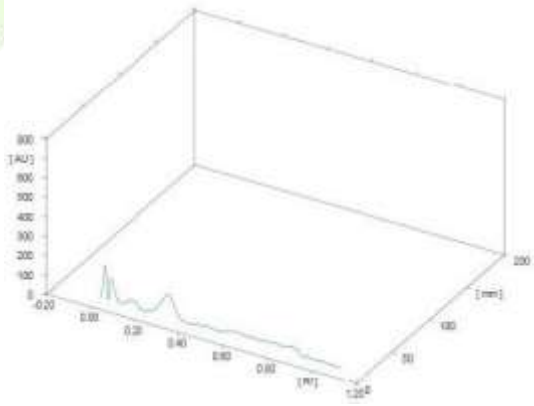
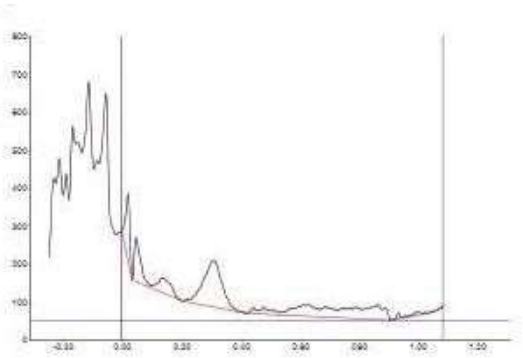
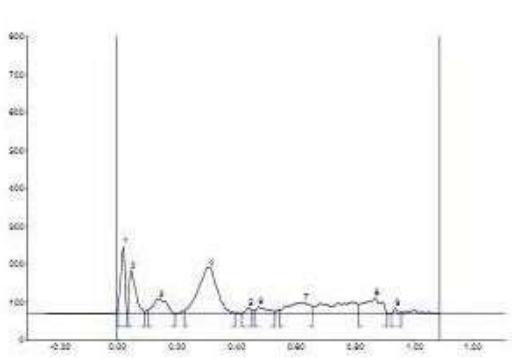


Table – 5 Analysis of high Performance Thin Layer Chromatography (HPTLC) of Siddha formualation Ajmothastaka Maaathirai(AM)





Peak table

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %
1	0.00	12.8	0.02	176.0	30.77	0.03	7.5	1245.2	12.40
2	0.03	11.6	0.04	114.3	19.98	0.09	4.7	1241.7	12.37
3	0.10	10.0	0.14	39.4	6.90	0.19	0.4	902.8	8.99
4	0.22	5.7	0.31	122.8	21.47	0.40	1.1	3824.7	38.09
5	0.42	0.4	0.44	16.2	2.83	0.45	8.5	139.8	1.39
6	0.46	8.3	0.47	18.3	3.20	0.53	5.3	337.9	3.36
7	0.55	10.0	0.63	29.1	5.08	0.66	19.6	1080.1	10.76
8	0.81	24.2	0.87	40.7	7.12	0.91	0.5	1185.8	11.81
9	0.92	0.4	0.94	15.2	2.66	0.96	3.6	83.6	0.83

REPORT:

HPTLC finger printing analysis of the sample reveals the presence of nine prominent peaks corresponds to the presence of nine components present with in it. Rf value of the peaks ranges from 0.03 to 0.92[27,28].

DISCUSSION

This study aimed to characterize the physicochemical properties of Ajamothastaka maathirai (AM), a Siddha herbo mineral preparation, using a variety of techniques. The findings provide valuable insights into the potential safety, quality, and future research directions for this traditional medicine. Physicochemical parameters such as ash content (19.96%) suggests the presence of minerals and non-combustible earthy materials in AM. This value provides a baseline for further investigation into the specific mineral composition. Low acid-insoluble ash (0.0%) indicates minimal silica content, which aligns with quality standards for herbal drugs. Water-soluble ash (18.33%) represents the portion of inorganic material readily dissolvable in water. Further studies could explore the specific water-soluble constituents; Loss on drying (2.93%) indicates a relatively low moisture content[26], suggesting good stability and potential for a longer shelf life for MAC. Extractive values like Water-soluble extract (18.33%) and alcohol-soluble extract (8.8%) provide an initial understanding of the proportions of polar and non-polar compounds present in the raw drug (Table 4). These values can serve as a reference for future studies aiming to isolate and identify the active constituents of AM. Chromatographic analysis TLC and HPTLC analyses were performed using visible light Short-wave UV light 254nm and light long-wave UV light 365 nm. Rf value of the peaks ranges from 0.03 to 0.92 (Table 5). This study serves as a preliminary investigation into the physicochemical properties of AM. While the findings provide a foundation for further research. Building on the insights gained from this study, future research can explore more about the herbo mineral formulation. This study lays the groundwork for a more comprehensive understanding of Ajamothastaka

maathirai and its potential as a therapeutic agent.

CONCLUSION

Physicochemical analysis of Ajamothastaka maathirai(AM) indicates that it falls within acceptable parameters for further investigation. The profile suggests potential safety and efficacy, which warrants further exploration through preclinical and randomized clinical trials. These trials would definitively establish the drug's efficacy, pharmacological properties, and therapeutic effects, potentially positioning Ajamothastaka maathirai (AM) as a complementary or alternative treatment option for Acid peptic disease, especially considering the potential side effects associated with conventional Disease-Modifying Antiulcer Drugs (DMARDS). On scrutinizing above data about the Siddha herbo-mineral preparation ajamothastaka maathirai is considered to satisfying the research world to accept the safety and efficacy. In this globalized world physicians depend widely on Proton Pump Inhibitors (PPI) to treat Gastritis in acute, chronic, and pan gastritis. Hence it might cause some short time side effect and cumulative effect likely chronic kidney disease (PPI induced intestinal nephritis), bacterial infection (Clostridium difficile), H.pylori infection, development of neuroendocrine tumors, Increased risk of fracture[25] etc,. In that case Ajamothastaka maathirai would be a better drug of choice. Though, this drug can be taken to the next level of preclinical and randomized clinical studies to validate the efficacy, pharmacological activities and therapeutic effect.

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