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PHARMACEUTICO ANALYTICAL STUDY OF PRATHAPAMARTHANDA RASA

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ABSTRACT

Rasayogas in *Ayurveda* have a wide range of therapeutic utilities and are fast-acting, even in small doses. Due to a lack of research in this area, many Rasayogas are not used in clinical practice. Hence, researchers propagate many formulations that can cure dreadful diseases. The present study concerns the Pharmaceutico analytical study of the formulation called Prathapamarthanda rasa mentioned in Rasendra Sara sangraha jwara adhyaya. Prathapamarthanda rasa is a khalviya rasayana. Ingredients are Sodhita Vatsanabha, Shodhita Hingula, Shodhita Jayapala and Shodhita Tankana. Physico-chemical analysis and instrumental analysis like XRD & SEM-EDAX were done to ensure the quality of the medicine prepared.

Keywords: Prathapamarthanda rasa, Physico chemical analysis, XRD, SEM-EDAX

INTRODUCTION

Rasasastra encompasses numerous *khalviya rasayanas* designed to provide therapeutic benefits through rapid absorption and minimal dosages. *Prathapamarthanda Rasa* is one such preparation, with readily available ingredients and prepared by simple pharmaceutical procedures. The ingredients present in this formulation have proven to be antipyretic activity. This study focuses on the *Prathapa-*

marthanda Rasa formulation mentioned in *Rasendra Sara sangraha* under *Jwara roga Adhikara*[1]. Analytical evaluation is crucial in standardising Ayurvedic medicines by ensuring quality, safety, and efficacy. In Ayurveda, the standardisation of raw materials, whether herbal or mineral, relies on their description, habitat, optimal collection period, and physical attributes such as colour, size, and weight. Similarly, prepared formulations are evaluated through specific parameters, such as *sneha paka lakshanas*, *avaleha lakshanas*, and *bhasma* tests like *Rekhapurnatva* and *varitaratwa*. The analytical study of *Prathapamarthanda Rasa* involves organoleptic evaluation, physicochemical parameters and advanced instrumental techniques like XRD and SEM-EDAX. Such studies aim to identify chemical configurations, understand the physicochemical changes during processing, evaluate the role of media, and establish objective parameters for quality assessment. These insights not only help standardise the product but also guide potential advancements in pharmaceutical processes.

1. Aims and Objectives:

According to Rasendra Sara Sangraha, the sample is analysed using various organoleptic, physicochemical, and instrumental methods to prepare Prathapamarthanda rasa.

2. Materials and Methods:

Pharmaceutical stride involved in the preparation of *Prathapamarthanda rasa:*

1. *Vatsanabha sodhana* in *Gomutra Nimajjana*, according to the reference in *Rasatarangini*[2]

2. *Hingula Sodhana* by *Nimbu swarasa Bhavana*, according to *Rasatarangini*[3]

3. *Jayapala Shodhana* by *Godugdha dolayantra Swedana* according to *Rasatarangini*[4]

4. *Tankana shodhana* by *Bharjana* method according to *Rasatarangini*[5]

5. Preparation of *Prathapamarthanda rasa* by *mardana* of all the ingredients till you attain a homogenous mixture.

Ingredients with quantity taken here: *Sudha Vatsanabha-10gm, Sudha Hingula-20 gm, Shudha Jayapala-30gm, Shudha tankana-40gm* (for each sample)

Procedure

Method of preparation: All the ingredients are weighed and taken in a clean *khalwayantra*. 10gms of s. vatsanabha, 20gm of s. hingula, 30gm of s. jayapala, and 40gm of s. tankana are weighed separately. The ingredients are mixed and pounded in the khalwayantra until a uniform mixture is obtained. About 6 hrs of mardana were required to get a homogenous powder. Then, it was sieved through a clean cora cloth and stored in an airtight glass container.

OBSERVATION:

- All three Samples Were Prepared By following the same procedure.
- All samples Attain Uniformity After doing Mardana for 6 Hrs
- A Slight Colour Difference is noticed in all three samples.

Table No 1: Showing Results of *Prathapamarthanda Rasa*

Results	Sample 1	Sample 2	Sample 3
Quantity of drugs used	100gm	100gm	100gm
Total time taken for *Mardana*	6 hours	6 hours	6 hours
Amount obtained	100 gm	100gm	100gm
Percentage of yield	100%	100%	100%
Weight loss in percentage	0	0	0
Colour	Bright red	Scarlet red	Brick red

Picture No. 1 Showing Stages of Preparation of *Prathapamarthanda Rasa.*

Analysis

Organoleptic parameters:

This study phase was conducted at the *Rasasala,* affiliated with the Department of RSBK, MVR Ayurveda Medical College, Parassinikkadavu, Kannur, Kerala.

Physicochemical analysis:

This study occurred at the Quality Control Laboratory, QA Department, Arya Vaidya Sala, Kottakkal, Malappuram, Kerala.

Instrumental Analysis:

- The crystallographic analysis of *Prathapamarthanda rasa* was performed using XRD at SAIF, CUSAT, Kochi.
- Study of SEM-EDAX was done at NIIST, Pappanamcode, Thiruvananthapuram.

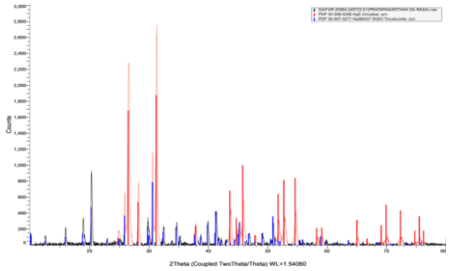
RESULTS FOR ORGANOLEPTIC FEATURES OF *PRATHAPAMARTHANDA RASA.*

Table No. 2 shows the organoleptic features of *Prathapamarthanda rasa.*

SI: NO	Characteristics	Sample A	Sample B	Sample C
1	Colour	Bright red colour	Scarlet red Colour	Brick red Colour
2	Rupa	Fine powder	Fine powder	Fine powder
3	Odour	Pungent	Pungent	Pungent
4	Taste	*Katu*	*Katu*	*Katu*
5	Touch	Fine	Fine	Fine
6	Shabda	Not applicable	Not applicable	Not applicable

Table No 3 Showing Physico-chemical characteristics of *Prathapamarthanda rasa.*

SI: NO	Characteristics	Sample A
1	LOD	3.85%
2	Total Ash	31.50%
3	Acid insoluble ash	2.46%
4	Water soluble extractive	43.95%
5	Alcohol soluble extractive	16.40%



XRD Graph pattern

Power diffraction of samples was done using coupled two theta/theta scan type in continuous scan mode from 2 theta angle of 10.000 degrees to 80.003 degrees, sample rotation 15.0001 per minute, using copper anode, wave-length for display at 1.54060 Angstroms and with a power of 40.0Kv and 35.0mA using Lynx eye detector and crystallinity from 10.000 to 80.003

Crystallographic parameters of the sample:

Crystal system: Hexagonal and Rhombo.H. axes

Space group: P3221, R-3

Space group number: 154, 148

Compounds present in the sample: Cinnabar (HgS), Tincalconite ($Na_2B_4O_7.5H_2O$)

Crystallite Size Present in *Prathapamarthanda Rasa:*

- 37.3nm
- 27.1nm
- 31.9nm

SEM-EDAX

processing option: All elements Analysed (Normalised)

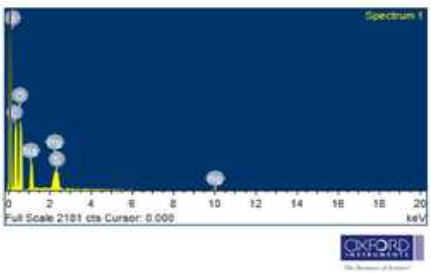
number of iterations: 7

Spectrum Processing: No peaks Omitted.

Table No 4 shows the EDAX report of *Prathapamarthanda Rasa*

Element Found	Weight %	Atomic %
Boron	19.09	24.42
Carbon	46.06	50.85
Oxygen	28.77	23.84
Sodium	2.54	1.47
Sulphur	0.53	0.22
Mercury	3.00	0.20

Picture No 2 Showing EDAX Report

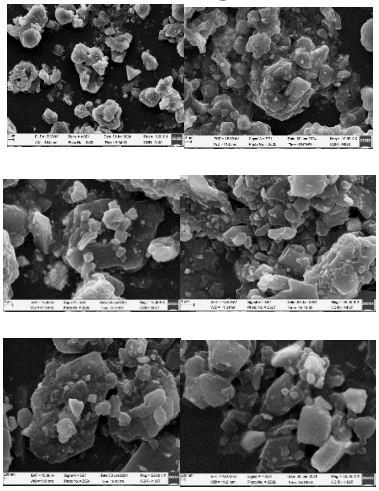


The SEM reveals that *Prathapamarthanda Rasa's particle size lies in the micro-sized* range, with an average size of 200nm at 30KX.

Table No 5 Showing SEM Results

Magnification	Particle Size
5.00KX	2µm
10.00KX	1µm
15.00KX	1µm
20.00KX	1µm
25.00KX	200nm
30.00KX	200nm

Picture No 3: Showing results of SEM.



DISCUSSION

Prathapamarthanda Rasa has been selected as the experimental drug. The ancient text *Rasendra sara sangraha* contains a reference to *Prathapamarthanda Rasa*, which has not been thoroughly investigated in modern times. This specific preparation is known for its unique method of preparation and its constituent components. It belongs to the category of *khalwiya rasayana* preparations and includes *visha dravyas* and other ancillary drugs. Critical ingredients of *Prathapamarthanda rasa* consist of *Shuddha vatsnabha, Shuddha Hingula, Shuddha Jayapala, and Suddha Tankana. Prathapamarthanda rasa* is renowned for swiftly alleviating fever *(Sadyo jwara Vinashana).* The pharmaceutical research aimed to develop *Prathapamarthanda Rasa*, involving theoretical and practical experimentation and evaluating documented findings and potential breakthroughs. The study rigorously handpicked the most suitable samples of raw drugs by meticulously assessing the presence of *Grahya lakshanas* mentioned in classical texts and modern parameters. This meticulous approach assures the absolute authenticity of the drugs under scrutiny. Raw materials of herbal and mineral origin were purchased from UG traders in Perambra on September 12, 2023. The raw materials were authenticated by the concerned authorities of the Department of Rasasastra and Bhaishajyakalpana, MVRAMC, Parassinikkadavu, on September 15, 2023.

The pharmaceutical study involved various practical procedures, such as purifying *Hingula* through *bhavana* in *nimbu swarasa*, purifying *Jayapala* through *dolayantra swedana* in *Godugdha*, purifying *Vatsanabha* through *Gomutra Nimajjana*, and purifying *tankana* through the *Bharjana* method. Finally, *Prathapamarthanda Rasa* was prepared by *Mardana* of all the ingredients in *khalwayantra* until a uniform mixture was obtained. The *Khalwa yantra* plays a

crucial role in the *Mardana* process by meticulously grinding the ingredients. The process of *mardana*, conducted during the final phase, brings together powerful ingredients like *Hingula, Vatsanabha, Jayapala,* and *Tankana,* harmoniously enhancing their effectiveness. Mardana minimizes particle size and ensures the final product is primed for optimal absorption and efficacy. The safety and effectiveness of a drug/product depend on its composition, which is assessed with various analytical parameters. Here, an attempt was made to follow various analytical parameters to figure out the exact nature of the drug within the limitations of the study.

Analytical studies include organoleptic analysis, Physicochemical analysis, and instrumental analysis-XRD and SEM-EDX. The organoleptic features of *Prathapamarthanda rasa* suggest potential Antipyretic effects. All samples exhibit a fine powder form, which enhances their surface area and facilitates an effective increase in Bioavailability. The pungent odour and bitter taste common to all samples are often associated with antipyretic properties, indicating the presence of active compounds with potential antipyretic activity. Although the colour varies—ranging from bright red to scarlet and brick red—the differences might reflect stages of preparation rather than directly impacting efficacy. Overall, the uniform fine texture, combined with the pungent and bitter characteristics, supports the likelihood of an antipyretic effect.

The analytical results for *Prathapamarthanda Rasa* indicate a generally positive outlook for its quality and potential antipyretic effects. The low moisture content (3.85%) suggests good stability and reduced risk of microbial growth, which is beneficial for maintaining its properties. The high total ash content (31.50%) could imply the presence of significant inorganic materials, which might affect overall quality and indicate potential impurities. However, the low acid-insoluble ash (2.46%) is a positive sign, indicating minimal non-soluble impurities and suggesting a relatively pure product. The high water-soluble extractive (43.95%) is particularly promising, as it points to a substantial presence of active constituents that can contribute to antipyretic effects. The moderate alcohol-soluble extractive (16.40%) suggests that some bioactive compounds are also alcohol-soluble, potentially enhancing the sample's effectiveness. The X-ray diffraction (XRD) analysis of *Prathapamarthanda Rasa* was conducted using a coupled 2θ/θ scan with a copper anode (λ = 1.54060 Å) at 40.0 kV and 35.0 mA. The results revealed the presence of hexagonal and rhombohedral crystal systems (space groups P3221 and R-3) and identified *Cinnabar (HgS)* and *Tincalconite (Na2B4O7·5H2O)* as the major crystalline phases, with crystallite sizes of 37.3 nm, 27.1 nm, and 31.9 nm, enhances antipyretic efficacy due to its nanostructure, which increases surface area and bioactivity. *Tincalconite*, a sodium borate hydrate, adds antifungal and antibacterial properties. The sharp, well-defined diffraction peaks indicate high crystallinity and purity, confirming the absence of major impurities and ensuring the formulation's safety and efficacy.

Overall, the XRD analysis validates that *Prathapamarthanda Rasa* is a high-quality product characterised by its nanocrystalline composition, stable crystalline structure, and therapeutic potential. The EDAX spectrum and SEM results provide a comprehensive insight into the composition and structure of *Prathapamarthanda Rasa.* The elemental analysis reveals a high content of Carbon (46.06%) and Oxygen (28.77%), indicating the presence of organic compounds or carbonates in the sample. The significant Boron content (19.09%) suggests a role in the formulation's structural or medicinal properties. The presence of Mercury (3.00%) is particularly important, as it could contribute to the product's claimed antipyretic effects. The SEM analysis shows that the particle size ranges from micro-scale to nanoscale; the fine particle size, with some particles as small as 200 nm, suggests a high degree of refinement and potential for increased bioavailability, a positive quality indicator.

CONCLUSION

Prathapamarthanda Rasa, a traditional *khalwiya rasayana* referenced in *Rasendra Sara Sangraha*, was selected for this study to explore its preparation, composition, and therapeutic potential. The formulation consists of purified *Hingula*, *Vatsanabha*, *Jayapala*, and *Tankana*, prepared through meticulous purification and grinding (*Mardana*) processes to ensure uniformity and enhance bioavailability. Analytical studies were conducted to assess its quality and potential antipyretic efficacy, including organoleptic, physicochemical, and instrumental methods (XRD and SEM-EDAX). The organoleptic analysis highlighted its fine powder form, pungent odour, and bit-

ter taste, which are commonly associated with antipyretic activity. Physicochemical tests indicated low moisture content (3.85%), high water-soluble extractives (43.95%), and minimal acid-insoluble ash (2.46%), reflecting stability, purity, and active constituent presence. XRD analysis confirmed the presence of *Cinnabar (HgS)* and *Tincalconite (Na2B4O7·5H2O)* as major crystalline phases, with nanostructures enhancing bioactivity and antipyretic properties. SEM-EDAX results revealed a refined particle size (as small as 200 nm) and a composition rich in carbon, oxygen, boron, and mercury, supporting its antipyretic potential. Overall, the study establishes *Prathapamarthanda Rasa* as a high-quality, well-processed formulation with promising antipyretic and therapeutic properties backed by scientific and traditional validation.

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