

## X-RAY DIFFRACTION ANALYSIS OF *MRITYUNJAYA RASA*

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## ABSTRACT

**Introduction:** *Mrityunjaya Rasa* is a Herbo-Mineral formulation, mentioned in *Jwara Chikitsa* along with various *Anupana* like *Madhu*, *Aardraka Swarasa*, and *Jeeraka Kashaya* with *Guda*. Ingredients like *Shudha Hingula*, *Shudha Gandhaka*, *Shudha Vatsanabha*, *Shudha Tankana*, *Pippali* and *Maricha* with properties of *Tikta*, *Katu Rasa Teekshna Guna* and *Deepana-Pachana*, *Swedajanana*, *Yogavahi* and *Jwaraghna* action show the significant result on various types of fever. To attain desired qualities in the finished product, it is much needed to check efficacy on modern parameters for standardization purposes. Thus, *Mrityunjaya Rasa* was subjected to X-ray diffraction spectroscopy to ensure SOPs followed for preparation. **Aim:** The study aimed to analyse the results of X-ray diffraction spectroscopy of *Mrityunjaya Rasa*. **Materials and Methods:** X-ray diffraction spectroscopy of *Mrityunjaya Rasa* was carried out at MIT–central instrumentation facility – innovation centre, Manipal, Udupi. **Results:** XRD study indicates that *Mrityunjaya Rasa* contains HgS (cinnabar), mercury sulphide in major phase and borax and elements Na, Ca, Mn, Mg, K, P, Zn, C, Cl<sub>2</sub>, Fe and B in minor phase. **Conclusions:** *Mrityunjaya Rasa* contains HgS (cinnabar), mercury sulphide in major phase and borax and other elements like Na, Ca, Mn, Mg, K, P, Zn, C, Cl<sub>2</sub>, Fe, and B are also present. Compounds and elements are present due to ingredients and *Shodhana* media which were used. This study can be a path for establishing the thumbprint of SOP for *Mrityunjaya Rasa*, a herbomineral compound formulation.

**Keywords:** *Mrityunjaya Rasa*, XRD, HgS, S, Borax, Na, Ca, Mn etc.

## INTRODUCTION

Rasaushadhi is found very effective in low dosage with faster action for the preservation and promotion of positive health and prevention of diseases mentioned by Acharya Gopalkrishna Bhatta<sup>1</sup>. *Ayurveda* employs the practice of *Rasaushadhi* (herbomineral preparations) for centuries for a wide range of illnesses. Modern medicine has very little documentation regarding the therapeutic value of metals and minerals. They are concerned about the safety of these compounds. Classical texts have figured certain tests which certify the proper transformation of basic metal and mineral into bio-absorbable form. But today due to queries arose about the safety of *Rasaushadhi* it is recommended to use advanced modern technology to ensure the proper formation of medicines. Several modern analytical techniques are available to know the material characterization of medicine. Among them, XRD (x-ray diffraction) is one of the significant techniques by which, compounds of the material and free metals in it (if in detectable limits) can be detected. Hence it is the need of the hour to produce fingerprints for quality medicines. Many researchers have analysed the metal and mineral-based individual *Bhasmas*. But the independent *Bhasmas* are used occasionally. Hence it is required to develop fingerprints not only for *Bhasmas* but also for the compound formulations.

*Mrityunjaya Rasa* is a Herbo-Mineral formulation, mentioned in *Jwara Chikitsa*<sup>2</sup> along with various *Anupana* like *Madhu*, *Aardraka Swarasa*, and *Jeeraka Kashaya* with *Guda*. Ingredients like *Shudha Hingula*, *Shudha Gandhaka*, *Shudha Vatsanabha*, *Shudha Tankana*, *Pippali* and *Maricha* with properties of *Tikta*, *Katu Rasa Teekshna Guna* and *Deepana-Pachana*, *Swedajanana*, *Yogavahi* and *Jwaraghna* action show the significant result on various types of fever.

Hence this formulation was selected for the study. Earlier few researchers have established the effect of *Mrityunjaya Rasa* in fever clinically. But to date, no scientific work has been carried out on this formulation concerning physicochemical

characterization, which is essential for drug standardization.

## MATERIALS AND METHODS

Raw drugs required for preparation were collected from SDM Ayurveda Pharmacy, Udupi., Preparation of *Mrityunjaya Rasa* was carried out in the practice hall of the department of PG Studies in *Rasashastra* and *Bhaishajya Kalpana*, SDM College of Ayurveda, Udupi.

### Pharmaceutical Preparation

The preparation was carried out following the method mentioned in *Rasendra Sara Sangraha*. All the ingredients were procured and seven *Bhavana* of potable water was given as *Bhavana dravya* was Anukta<sup>3</sup> and the number of *Bhavana* was also anukta<sup>4</sup> so seven *Bhavana* were given. Before each *Bhavana* mass was dried properly and after completion dried and stored.

### X-RAY DIFFRACTION ANALYSIS

X-ray diffraction spectroscopy of *Mrityunjaya Rasa* was carried out at MIT–central instrumentation facility – innovation centre, Manipal, Udupi.

### Sample Preparation

A few tenths of a gram of the material was ground into a fine powder and smeared onto a glass slide, assuring a flat upper surface. It was packed into a sample container and sprinkled on double sticky tape.

### Procedure

The X-ray was generated by a cathode ray tube and filtered to produce monochromatic radiation. It was collimated to concentrate and directed towards the sample. The interaction of the incident rays with the sample was produced. Constructive interference (and a diffracted ray) when conditions satisfied Bragg's Law ( $n\lambda = 2d \sin \theta$ ), these diffracted X-rays were then detected, processed and counted. By scanning the sample through a range of  $2\theta$  angles, all possible diffraction directions of the lattice were attained due to the random orientation of the powdered material. Conversion of the diffraction peaks to  $d$  spacing allowed identification of the mineral because each mineral has a set of unique  $d$  spacing. Typically, this

was achieved by comparison of d spacing with standard reference patterns.

### Results

The XRD pattern of *Mrityunjaya Rasa* shows the presence of HgS (cinnabar), mercury sulphide in major phase and borax and other elements like Na, Ca, Mn, Mg, K, P, Zn, C, Cl<sub>2</sub>, Fe, and B.

### DISCUSSION

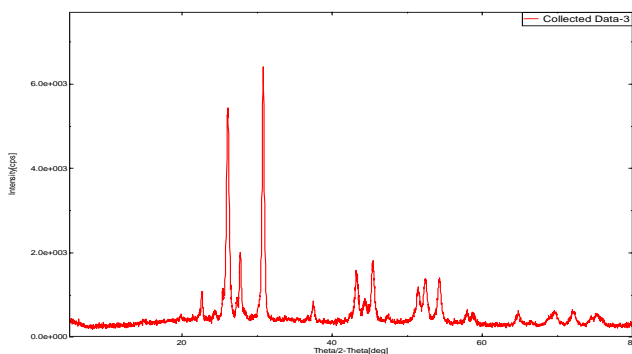
Lack of standardization is reflected as the biggest drawback in the growth and or differentially as per the individual requirement dissemination of Ayurveda<sup>5</sup>. Previously, the medicines were being prepared on small scale by the Ayurvedic physicians themselves, but now they are manufactured on large scale in pharmaceutical houses. For standardized medicine preparations, there is a need for a scientific approach. This study confirms the presence of ingredients of *Mrityunjaya Rasa*. 2 $\theta$  values depict peaks of ingredients in form of graphs. Compounds and elements are present due to ingredients and Shodhana media which were used. Among them,

XRD (x-ray diffraction) is one of the significant techniques by which, compounds of the material and free metals in it (if in detectable limits) can be detected. Hence it is the need of the hour to produce fingerprints for quality medicines. The XRD pattern of *Mrityunjaya Rasa* shows the presence of HgS (cinnabar), mercury sulphide in major phase and borax and other elements like Na, Ca, Mn, Mg, K, P, Zn, C, Cl<sub>2</sub>, Fe, and B.

### CONCLUSION

*Mrityunjaya Rasa* is a herbo-mineral formulation used in the treatment of *Jwara Roga*. *Mrityunjaya Rasa* prepared classically was subjected to X-ray diffraction analysis. Modern techniques facilitate knowing the final product in detail. The XRD study indicates the presence of HgS (cinnabar), mercury sulphide in major phase and borax and other elements like Na, Ca, Mn, Mg, K, P, Zn, C, Cl<sub>2</sub>, Fe, and B. Hence both classical and modern analytical parameters must be used for validation of the proper preparation of Ayurvedic formulations.

**Figure 1:** XRD spectrum obtained for *Mrityunjaya rasa*



**Figure 2:** XRD Peak display of *Mrityunjaya rasa* compared with Mercury (Hg)

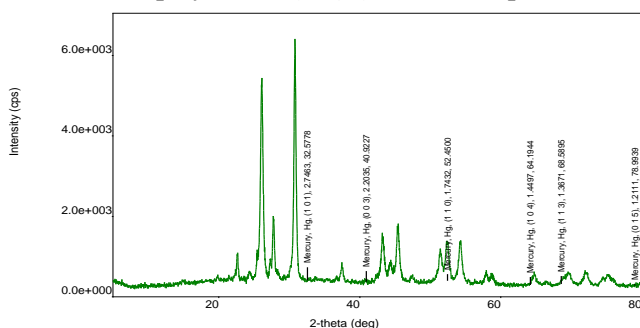


Figure 3: XRD Peak display of Mrityunjaya rasa compared with Sulphur (S)

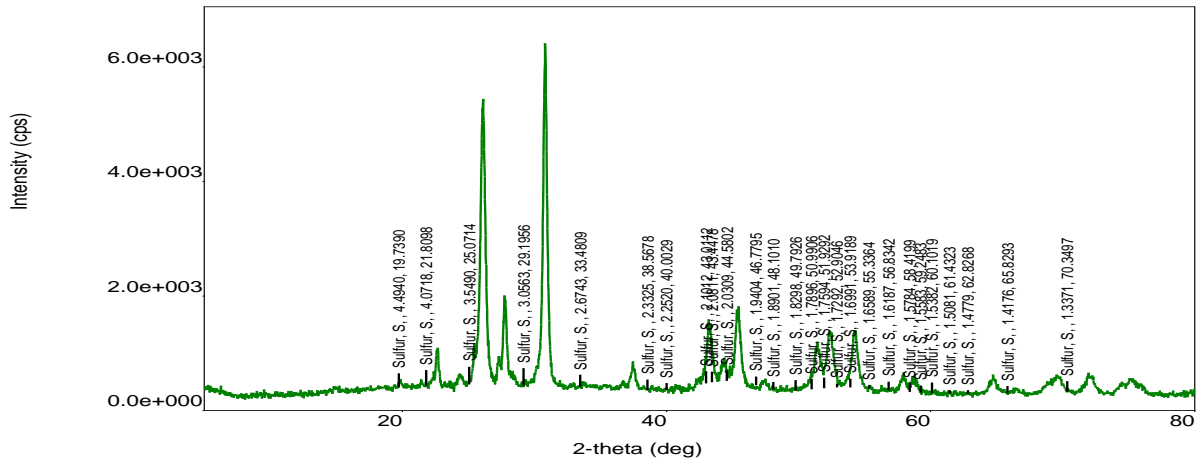


Figure 4: XRD Peak display of Mrityunjaya rasa compared with Cinnabar (HgS)

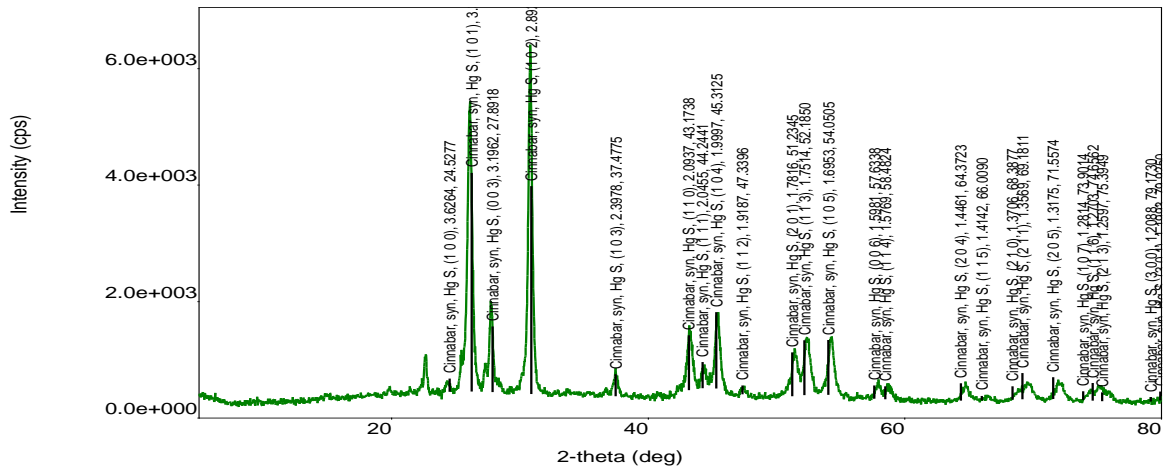
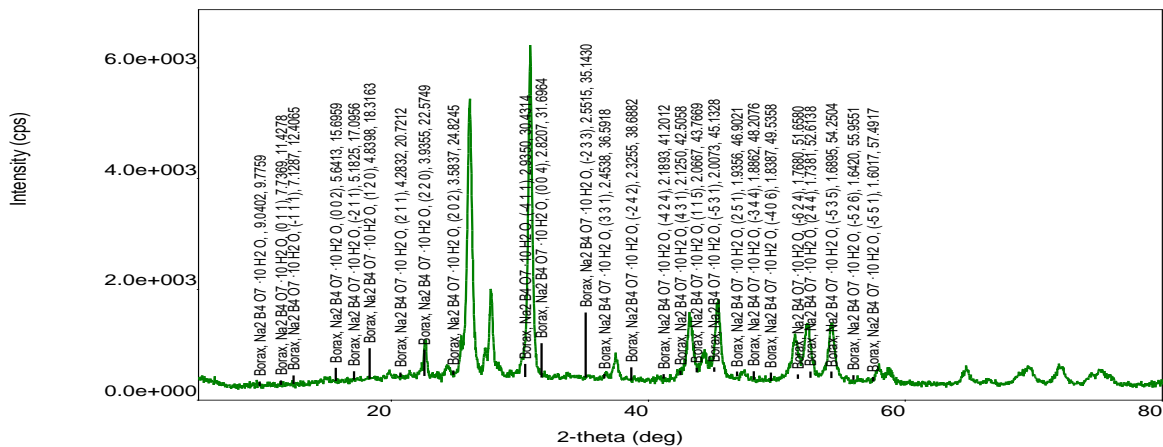


Figure 5: XRD Peak display of Mrityunjaya rasa compared with Borax



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