



**Physico-Chemical Analysis of *Mrig-shring* (deer calyx) *Bhasma*-An approach to standardization of calcium products in Ayurvedic health management**

Jagannath Haryan<sup>[1]</sup>, Sudhaldev Mohapatra<sup>[2]</sup>, Sameet Masand<sup>[3]</sup>, Tejaswini B.K<sup>[4]</sup>, Indrajeet Singh Kushwaha<sup>[5]</sup>

<sup>1</sup>Associate . Professor. VYDS Ay. Mahavidyalaya, Khurja

<sup>2</sup> Associate . Professor VYDS Ay. Mahavidyalaya, Khurja

<sup>3</sup> Assistant . Professor. VYDS Ay. Mahavidyalaya, Khurja

<sup>4</sup>Assistant Professor. VYDS Ay. Mahavidyalaya, Khurja

<sup>5</sup>Assistant . Professor . A&U Tibbia Collage, Delhi.

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**ABSTRACT:-**

Ayurveda is having a large materia medica for the treatment of various diseases with different sources of raw materials. *Mrig-shringa bhasma*, an animal product, rich in calcium has been used since samhita period in many diseases like *hritshul* [cardiac pain], *udarshul* [abdominal colic pain], *grahani* [IBS], *gulma* [abdominal discomfort] etc. very effectively. The current study was conducted to prepare a finger print of *Mrig-shringa bhasma*, which could be used by various stakeholders of Ayurveda drug manufacturers, researchers and clinicians. Raw *Mrig-shringa* is subjected to shodhan process by the *swedan* [fomentation] technique taking lemon juice as media of *swedan* for 3hr. Then it was triturated with Arka ksheer [*Calotropis gigantea*] followed by incineration in gaja puta for 03 times. After observing the quality control criteria complied with *varitara*, *rekhapurna* like features described in literatures of Rasa Shastra, it is then subjected to SEM and EDAX study. EDAX study reveals that the *Mrigshringa bhasma* contains Ca (66%), P (32.46%), K (1.41%) and SEM study shows the *bhasma* obtained is having the particle size of 109.2nm.

**KEY WORDS :** *Mrig-shringa*, *Bhasma*, EDAX, SEM, *Arka ksheer*

## INTRODUCTION

In Ayurvedic healing system *Mrig-shring bhasma* has been used for *hritshula* (cardiac pain), *amashaya*, *parswa*, *shula* (gastro-intestinal, colic pain)<sup>[1]</sup>, as well as a potent drug for calcium supplementations, hiccough, *swasha* [bronchial tree diseases], cough etc.<sup>[2]</sup> In general, for pharmaceutical processings, *Mrig-shringa* is first subjected to *shodhana* and then *marana* for achieving its *bhasma*. For *shodhan* it is subjected to *swedana* [fomentation] process for 3hr. taking lemon juice as media of *swedana* <sup>[3]</sup>. For *marana* *suddha Mrig-shringa* is made into pieces and burnt in *gajaputa* system of heating without sealing the joints of *samputa* during the process, to facilitate aerobic condition of heating. Then it was fired in same *gajaputa* system of heating for 03 times, after triturating with *Arka ksheera* and following the standard operative procedures for *maran*.<sup>[4]</sup>

*Mrig-shringa bhasma* is used as a single constituent formulation or in many multi-ingredient formulations. However, there is variation in collection of raw materials and the pharmaceutical procedure followed, which generates the same *bhasma* with different characters. As a result, reproducibility is often not achieved. In many cases, wrong manufacturing and marketing practice leads to the production of inferior quality products, which reduces efficacy or produces safety concerns. In order to minimize variability and to check adulteration, standardization of a *bhasma* is an obligation.

Ayurvedic literatures have ample of methods for quality control of finished products i.e. *bhasma* through different parameters like *nischasndratva* [without having any shining], *varitara* [able to float over water] etc., to achieve a definite acceptable standard *bhasma*. This study was carried out to analyze and characterize the *Mrig-shringa bhasma* using

contemporary, sophisticated and sensitive tools and techniques. The fingerprint observations generated for the *bhasma* could have immense help to different stakeholders of this field and be used as standards for ensuring quality and reproducibility of standards of the medicine i.e. *Mrig-shringa bhasma*.

## MATERIALS AND METHODS:

### Pharmaceutical Processings of *Mrig-shring*

This was carried out by using standard operative procedures described in *rasa literatures* and in contemporary literatures concern. The entire processings of *Mrig-shringa* included in two steps, namely *shodhana* and *marana* of *Mrig-shringa* <sup>[3]</sup> <sup>[4]</sup>. The *Mrig-shringa* was procured from the authenticate market and validated by the experts, lemon juice (q.s) was prepared in the laboratory of Shri Venkateswara Ayurvedic Medical College, Tirupati and *Arka ksheera* [*Calotropis gigantea*] was collected from the herbal garden of the same college by following standard procedure of cleanliness and drug collection.

Other materials like *imamdasta*, knife, casseroles, stainless steel vessels, rag and mud, mortar and pestle, *puta* system of heating, cow dung cake, iron ladle, pyrometer etc. were arranged locally.

At first the *Mrig-shringa* was made into small pieces, taken into a cotton pouch, tied and hanged into the vessel containing lemon juice for *swedan* by means of a still rod placed over the vessel. It was observed that the entire pouch was dipped into the lemon juice throughout the process. Mild temperature was given for 03hr. with adding of fresh lemon juice in between the process, to maintain the volume of juice constant throughout the process. After 03 hr. the gray color material from inside the cotton pouch was

collected called *suddha Mrig-shring* and washed in warm water, then subjected for marana, to prepare its *bhasma*.

For the *Marana* of *Mrig-shring* [4] *shuddha* material is further made into small pieces, kept in a casserole, covered with another casserole so as to fit mouth to mouth. Then without sealing the joint it was subjected to *gajaputa* system of heating. After self cooling, gray-black color material was collected, triturated with *Arka ksheera*, pellets were prepared, dried, kept in earthen casserole and fired in *gajaputa* system of heating by following standard operative procedure of *puta* system of heating. 03 firings were given to achieve desired quality of *bhasma*. The *bhasma* obtained from the above process was taken for analysis.

#### **Analysis of *Mrig-shring bhasma* by following parameters described in *Rasa literatures* [5]**

The final *Mrig-shringa bhasma* was analyzed for quality control as described in Ayurvedic texts as follows and found suitable:

1. *Nischandratva*: The *bhasma* was taken in a Petri dish and observed for any luster in daylight through magnifying glass. No luster was observed in the *bhasma*.
2. *Rekhapurnatvam*: A pinch of prepared *Mrig-shring bhasma* should be taken in between the thumb and index finger and rubbed. Properly prepared *Bhasma* should enter into the creases of the fingers and should not easily be cleansed out. This test confirms the fineness of *bhasma*.
3. *Varitaratavam*: A small amount of the prepared *bhasma* was sprinkled over the still water in a beaker. It was found that

the *bhasma* particles floated over the surface of the water.

4. *Nisvadutvam*: The prepared *bhasma* was found to be tasteless when a small amount was kept on the tongue.
5. *Uttama*: A small amount of the prepared *bhasma* was sprinkled over the still water in a beaker. Then one rice particle was kept over the floating *bhasma*. It was found that the *rice* particles found did not sink into the water.

#### **Analysis of *Mrig-shringa Bhasma* by using *Scanning Electron Microscope [SEM]***

Scanning Electron Microscopy [6] [SEM] was performed in the Dept. of Physics, Sri Venkateswar University, Tirupati.

SEM machine used is having Model No-EVO MA 15, Carl Zeiss – Germany.

Properly prepared and mounted sample with the sample holder was placed inside the microscope's vacuum column through an airtight door, and then the air was pumped out. After the air was pumped out of the column, a beam of electrons was emitted by an electron gun from the top. This beam travels downward through a series of magnetic lenses designed to focus the electrons to a very fine spot. Near the bottom, a set of scanning coils made the focused beam to move back and forth across the mounted sample, row by row.

As the electron beam hits each spot on the sample, secondary electrons are backscattered from its surface. A detector counts these electrons and sends the signals to an amplifier. The final image was built up from the number of electrons emitted from each spot on the sample [Figure- 2].

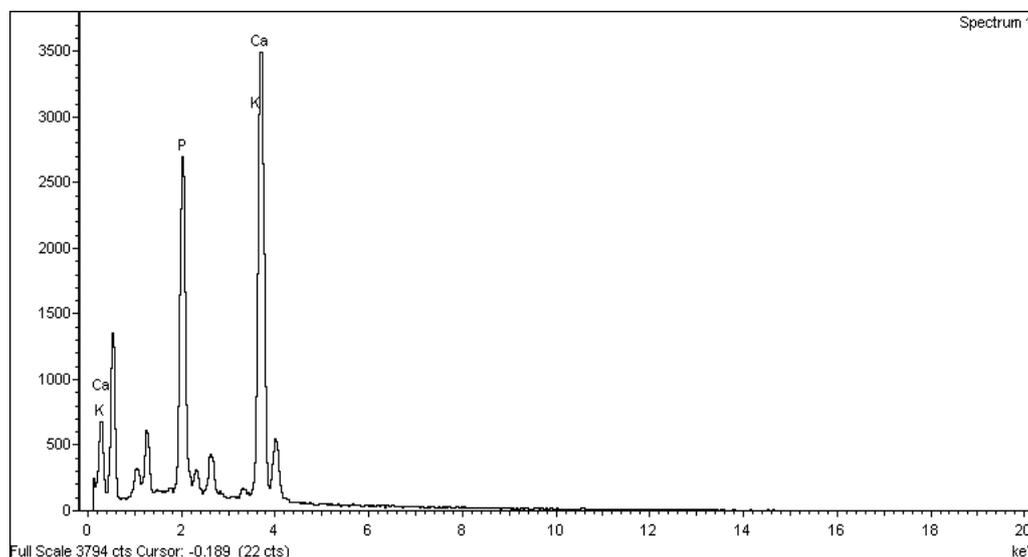
The particles in the *Mrig-shring bhasma* were observed uniformly arranged. In the sample agglomeration of

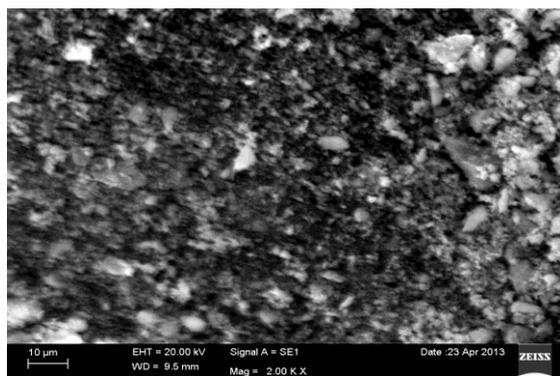
grain were observed. The size of the particles was at nanometer level in the final product. The scanning microscope images that were obtained from various regions of sample clearly depicts that at different magnifications the grain size was commonly found to be ranging between 109.2nm at 5K magnification to 87.18nm at 7K. Particles are found to be agglomerated due to presence of natural tannins and resins which has partial binding nature. Percentage of particles that were found to be agglomerated is less at 1K (10 – 20%) magnification than at magnification of 3K (50%). Possibly this behavior is due division of major particles into smaller ones at the time of final trituration before making drug ready for usage.

#### ***Analysis of Mrig-shringa Bhasma by using Energy Dispersive X-Ray Analysis [EDAX]***

It is an analytical technique used for the elemental analysis or chemical characterization of a sample. Being a type of spectroscopy, it relies on the investigation of a sample through interactions between electromagnetic radiation and matter and then analyzing the X-rays emitted by the mater in response to being hit with charged particles. Its characterization is due to the fundamental principle, that each element has a unique atomic structure. [5]. EDAX systems are attached on SEM equipped with a cathode and magnetic lenses to create and focus a beam of electrons. A detector is used to convert X-ray energy into voltage signals; this information is sent to a pulse processor, which measures the signals and passes them onto an analyzer for data display and analysis. [7]

EDAX study reveals that *Mrig-shringa* bhasma contains calcium-66.13%, phosphorus-32.46% and potassium-1.41% by weight. [Figure-1]





## OBSERVATION AND RESULT

*Mrig-shringa bhasma* was prepared by following the standard operative procedure for *bhasma* preparation. Then it was physico-chemically analyzed by following both ancient and contemporary tools and techniques.

Following ancient quality control parameters the said *bhasma* was analyzed to access *varitara*, *rekhapurna*, *uttama*, *niswadu* and *nsichandratwa*. The *bhasma* was found complied with all the parameters.

By following contemporary physico-chemical analysis the said *bhasma* was analyzed through SEM and EDAX. It was observed that at different magnifications the grain size was commonly found to be ranging between 109.2nm at 5K magnification to 87.18nm at 7K and particles were agglomerated, through SEM study. In EDAX study it was revealed that *Mrig-shringa bhasma* contains calcium-66.13%, phosphorus-32.46% and potassium-1.41% by weight.

## DISCUSSION

It is noteworthy that there are very specific pharmaceutical procedures and techniques described in the *rasa shastra* literature which convert the raw materials of different origin into a noble dosage form. The *bhasmas* prepared out of different raw materials are said to be well

tolerated both for short-term and long-term use. According to the need of time, characterization of *bhasma* using scientific techniques is necessary to determine the effect of the process and to judge its safety and efficacy.

Analysis of SEM reports of *bhasma* elucidates gradual reduction of the grain size, increase in regularity, and uniformity of the grain with increasing the number of *Putas*. The significant reduction of the particle size of the final product justifies

the *Rekhapurnata* and *Varitaratwa* character of *Bhasma* claimed in the ancient texts. *Mrig-shringa bhasma* was prepared and studied with this objective. *Rekhapurnatwa* and *varitratwa/uttama* quality of *bhasma* reflects its size and lightness achieved through the traditional process of *bhasmikaran* [incineration] i.e. *puta* system of heating has significant role for size reduction of raw materials to the nanometer range *bhasma* particles as well as to increase the uniformity of *bhasma* particle<sup>[5]</sup>. It highlights the ancient technology of size reduction and their applicability in biomedical system in view of the current nanotechnology.

Scanning electron microscopy study showed that the particle size of *Mrig-shringa bhasma* significantly reduced to range of nanometer i.e. found to be ranging between 109.2nm at 5K magnification to 87.18nm at 7K. It justifies the potency of ancient traditional pharmaceutical processings for size reduction. The nanometer ranges of bio particles have tremendous biotechnological applications now days. Hence the current research work will leave the fingerprint data for *Mrig-shringa bhasma* that could have immense help to the researchers of biomedical field as well as to the stakeholders of Ayurveda. EDAX study reveals the presence of Ca, P and K; 66.13%, 32.46% and 1.41% by weight respectively. The data observed indicates

that *Mrig-shringa* bhasma is alkaline in nature and have rich in calcium. This may be the reason for it's old age use in *hritshula* (cardiac pain) because calcium has proven important role in cardiac metabolism. However further study is require for therapeutic effect validation. Due to rich in calcium it is clinically used as potent supplement for calcium deficiency diseases.

## CONCLUSION

Thus, *Mrigshringa*, an animal product when converted to it's bhasma, by using the traditional Ayurvedic technology for bhasma preparation it's size reduces significantly ranging between 109.2nm to 87.18nm. Also it was observed that the bhasma prepared is alkaline in nature and rich in calcium. As a result of different stages of processing techniques

like *shodhana* (which involves *swedana*, with sour herbal juices considering as medium) and *marana* [which involves *bhavana* (wet trituration with *Arka ksheera*, a strong alkaline material) and *puta* system of heating], the particle size reduces significantly, which may facilitate absorption and assimilation of the drug into the body system. The particle size in the final *bhasma* was ranging between 109.2nm to 87.18nm, which could be specified as the criterion for the final product conforming to all the traditional parameters under *bhasma pariksha* (examination of properly prepared *bhasma*). This can be one of the important factors for standardization of said *bhasmas* by following the 'SOP' of *bhasma* preparation. With the assistance modern techniques characterization of *Mrig-shringa bhasma* could have immense help both for researchers and clinicians.

## REFERENCES

1. Sharma Sadananda, Rasa Tarangini, Chapter-12/108-109, Motilal Banarasi Das Publication, Varanasi; 2004.
2. Acharya Agnivesh, Charak Samhita, Charak Chandrika commentary by Brahmanand Tripathy Sutrsthan-27/45-46, Chawkhamba Surbharati, Varanasi, 6<sup>th</sup> edition, 1999.
3. Sudhaldev Mohapatra, Sharma R, Calcium product in Ayurveda At a Glance, Ayurveda Mahasammelan Patrika, No.04/ April/2012: 19-23
4. Sharma Sadananda, Rasa Tarangini, Chapter-12/105-107, Motilal Banarasi Das Publication, Varanasi, 2004
5. Mohapatra, Sudhaldev, and Chandra Bhushan Jha. "Analytical study of raw Swarna Makshika (Chalcopyrite) and its Bhasma through TEM and EDAX." Ayu vol. 34, 2 (2013): 204-8. doi:10.4103/0974-8520.119682.
6. Mohapatra S, Jha CB. Physicochemical characterization of Ayurvedic bhasma (Swarna makshika bhasma): An approach to standardization. *Int J Ayurveda Res.* 2010 Apr; 1(2):82-6.
7. <http://www.en.wikipedia.org/wiki/EDAX>. [Last accessed on 2013 Feb 05]

**CORRESPONDING ADDRESS**

Dr.JAGANNATH HARYAN

Associate Professor.

VYDS Ay. Mahavidyalaya,

Khurja, uttar pradesh

Email Id : dr.jaganharyan@gmail.com

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