General Standardization Techniques of Bhasma: A Review

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ABSTRACT: *Rasa-Shastra* is the branch of Ayurveda which deals in detailed description of metallic, non-metallic substances, products of animal origin to transform into dosage forms. These forms have qualities of palatability, non-toxicity, assimilation, adaptability etc. in the body. These methods were well known in Indian subcontinent since 7th century A.D in Indian systems of medicine. The unique ayurvedic herbo-mineral preparations are widely used for the treatment of a variety of chronic ailments. These dosage forms are generally in the form of *Parpati, Rasayoga, Sindoora, Pishti* etc. The adaptability of these dosage forms and methods are generally questioned by contemporary science due to lack of parallel standard protocols.

Keywords: Ayurveda, Rasashastra, *Bhasma*, nano-particle, standardization

INTRODUCTION:

Bhasma are said to maintain the optimum alkalinity, neutralize and breakdown the harmful heavy metals and radicals in body. The alleviation of a disease depends upon the quality of *Bhasma* prepared through standard procedures. The standardization of *Bhasma* is utmost necessary to confirm its identity and to determine its quality, purity safety, effectiveness and acceptability of the product. But the most important challenges faced by these formulations are the lack of complete standardization by physiochemical parameters. Here the paper discusses the various methods to standardize the *bhasma*.

Bhasma a Herbo-mineral form

The concept of incineration of metals along with herbal decoctions is discussed in *ayurvedic* classical literature *'Charak Samhita'.*[1] A '*Bhasma'* means a form of substance which is obtained after incineration.

In general, these are physically transformed metallic nano-particles which are transformed in form of *bhasma* by calcination of substances after treatment with herbal decoctions, natural compounds. The mmetallic, non-metallic substances, and various animal derivatives i.e. horns, shells, feathers, are also used to produce *bhasma*. The standard procedures and quality of raw materials can help to maintain the minimum variability in

quality, quantity and efficacy of final product. The standardization can be divided into two phases:

A) The method of preparation of *bhasma*
B) The standardization of *bhasma*

A) Method of Preparation of *bhasma*[2]

Commonly practiced metallic preparations are i.e. *lohabhasma, abhraka Bhasma, swarna bhasma, tamra bhasma* etc. The Bhasma preparation steps are as follows:

1. ***Shodhana*(Purification)**

Raw metals for the *bhasma* are obtained from ores, which generally contain unwanted impurities. The impurities are removed by the process of *shodhana.* The resultant product can be subjected to undergo the process of bhasmikarana .i.e.,*Marana*.

2. ***Bhasmikarana***

It is the process to eliminate the toxicity or undesired effect of the specific material. This process develops the biocompatible qualities in substance following the purification processes. The substance develops the desired physical and medical properties i.e. palatability, bioavailability, microscopic particle size etc.

3. ***Maran* (Powdering)**

Maran is the process which transforms the metals into a suitable and desired bio-compatible form for assimilation of phytochemicals in next phase.

4. ***Chalana* (Stirring)**

The *Chalana* is the process of heating the powdered metal and stirring. The stirring is carried out with iron rod or stick of specific plant continuously. The quality and therapeutic efficacy of end product may be enhanced by the help of the phyto-chemicals of plant stick.

5. ***Dhavana*(Washing)**

The *shodhana* or *marana* phase co-agents are removed by the process of dhawana by water. These residuals can impact the quality of final products.

6. ***Galana*(Filtering)**

The material is sieved through a fine sized mesh sieves or cloth. The *galena* process helps to separate the residual material particles of larger size.

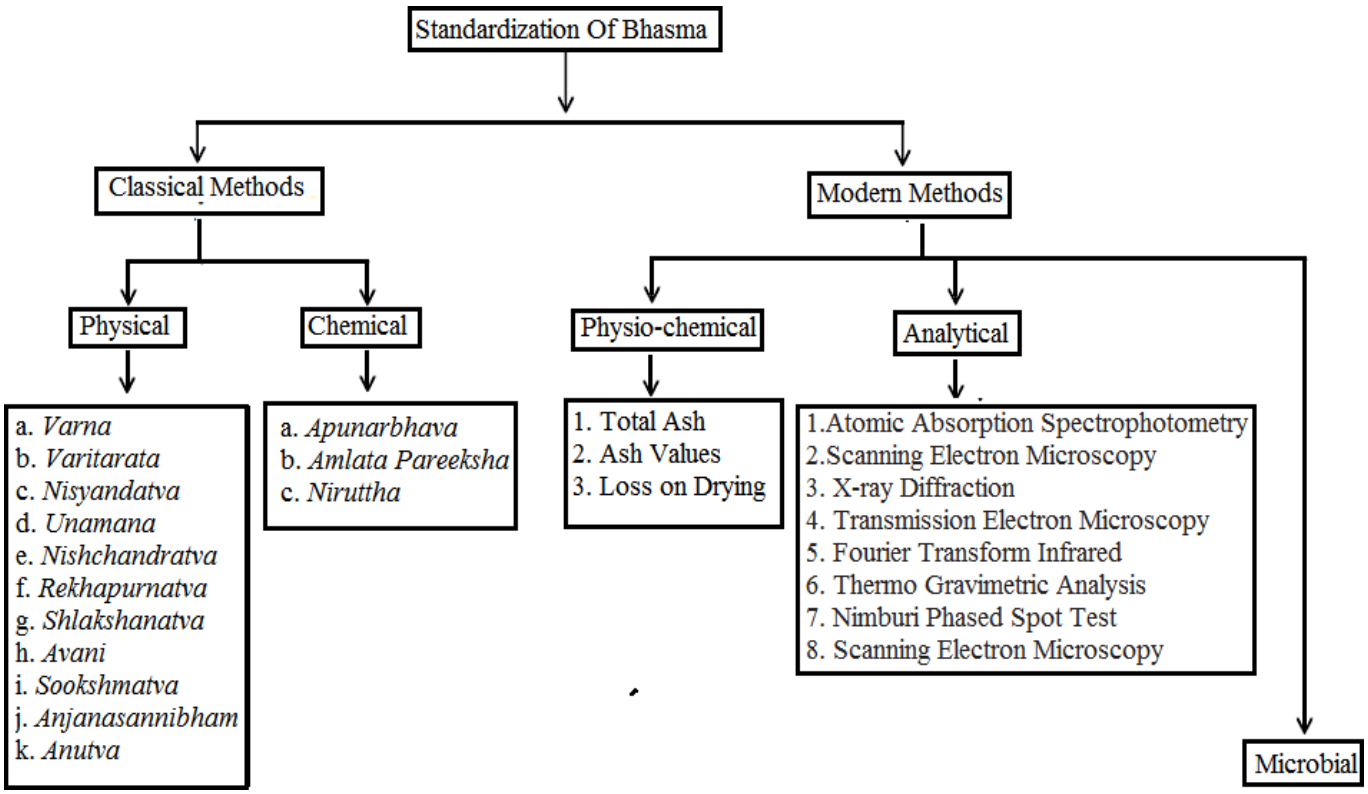
7. ***Puta* (Heating)**

The pure product of *bhasmiakarna* is heated on high temperature to incinerate in process of *puta*. These are the general steps used in preparation of a *bhasma*. The standard procedures and co-agents can be different for a specific substance to produce *bhasma.*

B)* Quality control of *bhasma

The end product of incineration is known as *Bhasma*. The properties of *bhasma* are different from the primary substance which are analyzed as per the following b*hasma* assessment methods,

1. Classical methods of analysis.
2. Modern methods of analysis.



➢ **Classical Methods**[3][4]

Physical Characteristics

The standardization of raw materials are determined by the physical characters. These physical characters includes shine, texture, appearance, color, size, shape, taste, consistency, volume, smell and weight etc.

a. Varna

The colour of a *bhasma* is generally specific characteristic of the primary substance. The change in colour of *bhasma* suggests that *bhasma* is not prepared properly.

b. Nisvadutam

A particular taste or tastelessness is the quality of properly incinerated particular *bhasmas.*. The change of substance with specific taste to a particular taste is characterstic of *bhasma.* metallic *bhasma* may show deviation in taste.

c.*Nishchandratvam*

Lustiness is the characteristic of a metal. A metallic b*hasma* is examined in a petri dish under bright sunlight. The lusterlessness is the characteristic of a good quality *bhasma* prepared after complete incineration of metal.

d. Varitara

There is tendency of lighter molecules of a substance to float over liquid due to higher surface tension of liquid. A properly incinerated *bhasma* is dusted over stagnant water in a transparent jar on room temperature. The properly incinerated

bhasma with light and fine particles will floats on water surface. This is the *Varitara* quality of a *bhasma.*

e. *Unama*Test

It is the next level test of *varitara* quality of *bhasma*. A grain of rice is placed on the layer of *bhasma* of *varitara* test over water surface carefully. As the grain stays floating on the layer of *bhasma* above water and doesn't sink. This proves the proper incineration of substance to nano-particles and it is considered as of excellent quality.

f. Rekhapurnatvam

A *bhasma* is rubbed by examiner between the index finger and thumb to perform the *Rekhapurnatvam* test. The *bhasma* particles get into the cervices of the fingers easily due to its fineness. The adsorbed *bhasma* can't be washed out from the cervices of the fingers. The *bhasma* is considered as properly prepared and incinerated. This is the physical test of the micro size of *Bhasma* particles, which intend for fast absorption and bio-availability in the body.

g. Slakshnatvam

Shalakshnatvam means smoothness of substance. The properly prepared and incinerated *bhasma* develops the *shlakshnatvam.* The s*hlakshna* quality doesn't produce harmful effect and irritation to internal mucous membrane of Gastro-intestinal tract. It facilitates the proper absorption through mucosa and assimilation of *bhasma* into blood.

h. Sukshmatva

The *Sukshmatva* character is complemented by *varitara* and *Rekhapurnatvam* qualities for the assessment of *bhasma.* The *bhasma* is absorbed and gets assimilated in body due to its standard characterstic of fineness.

i. Anjana sannibha

Collyrium has properties of smoothness, fineness and doesn't irritate the eyes. A properly incinerated and prepared *bhasma* should have properties alike collyrium.

j. Avami

Generally a well prepared *bhasma* should not show any acute or delayed adverse effects. An incompletely prepared *bhasma* can develop some complications i.e. nausea and vomiting on internal administration.

k. Particle Size

The smoothness and fineness of a *bhasma* should be alike the pollen grains of *ketaki* flower *(Pandanus odoratissimus)*.

Chemical Characteristics

A *bhasma* shows some chemical characters which are used as classical assessment methods.

a. Apurnabhavta

A properly incinerated metallic bhasma shows the inability to retrieve its primary metallic form. The final finding of the *Apurnabhavta*, results in finding the metal free particles of bhasma.

b. Niruttha

The stability of *bhasma* is tested by niruttha test. The *bhasma* is heated on high temperature with equal amount of pure silver. The silver shows high chemical affinity for other metals and low melting point. Due to these qualities, the silver gets other metals adsorbed. If the bhasma is unstable then the free metal present in the bhasma will combine with silver thus increasing its weight.

c. Amlapariksha

This is peculiar test for *tamra bhasma.* It is sprinkled on sour curd. If the colour of curd remains unchanged then bhasma is properly incinerated. If the shows the blue colour of copper salts, the bhasma is not properly prepared and there is free metal present in the bhasma.

2. Modern Methods for analysis of *Bhasma*[5]

Physical standardization standards of *Bhasma* can be analyzed with following specific tests:

a. Atomic Absorption Spectrophotometry

The quantitative analysis of metals in *bhasma* is done by atomic absorption spectroscopy. It works on phenomenon that the incident light excites the atoms of inorganic material to higher transitional state. In this state the atoms emit the light of particular wavelength according to the proportion of their concentration available.

b. X-ray Diffraction

Phytochemicals have specific characteristic structural arrangement of the components. X-ray diffraction technique helps to find the characteristic arrangement of structural units in *bhasma*.

c. Scanning Electron Microscopy (SEM)

A focused scanning electron micro beam from SEM is targeted on the specimen to produce topographic images of the sample. The topographical analysis of different materials shows different footprints.

d. Transmission Electron Microscopy (TEM)

In this process, specimen is analyzed by the transmission of the electrons through the specimen of material and there is formation of an image by the interaction of electrons. This image is magnified, focused and captured on photographic film of an imaging device.

e. Fourier Transform Infrared

The phyto-chemical compounds have a functional chemical group which can be determined by Fourier Transform Infrared method. This can be ascertained by the marked selective absorption in the infrared region and produce the structure and characteristic of functional group in form of close-packed wide wavelength absorption spectrum bands.

f. Thermo Gravimetric Analysis (TGA)

TGA method determines the purity of samples. In this method, there is controlled rate of heating or cooling of substance and the weight is noted on functional axis of time or functional axis of temperature. The thermo-gravimetric curve plot of weight change versus temperature of time shows the observations.

DISCUSSION:

There are various methods mentioned in classics which are used as tool to determine the quality of *bhasma*. These methods are generally self-sufficient and reliable for

analysis of *rasa aushadhi*. In general the materials used in complete process of *bhasma* preparation include metallic, non-metallic, products of animal origin. These substances have peculiar physical, chemical nature which can be traced with variety of analytic tools. All these techniques can be utilized to standardize all steps and phases of *bhasma* preparation from selection of raw materials to final products. it is utmost important to produce *Bhasma* of standard quality by following systematic *Ayurvdic* classical and modern standards. The *bhasma* analysis methods are qualitative in and do not stress upon the characterization on the modern scientific parameters. The physio-chemical modern analytical parameters can be handy to understand the qualities of final *bhasma* product in detail. The detailed data can be documented for further study and researches.

CONCLUSION:

Bhasma are complex herbo-mineral products. *Bhasma* can utilize the classical as well as modern parameters and methods to evaluate the quality and quantity. The physio-chemical analytical technologies develop more trust in authenticity and efficacy of *ras aushadhi*. This definitely help in uniformity in product quality, efficacy and results.

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