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Research Article

PHYSICO-CHEMICAL ANALYSIS OF NISHCHANDRA ABHRAKA BHASMA PREPARED BY TRADITIONAL PUTA METHOD

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ABSTRACT:

Bhasma is a stable, bio-available, non toxic, palatable form of any metal or mineral, only when, the drugs are processed well for *Shodhana* or *Marana* etc. as per *Ayurvedic* texts. In the current study when *Abhraka Bhasma* was prepared by traditional *Putra* method of *Rasasara* its takes 18 *Putra* to complete the process of *Bhasma nirman*. After the completion of 18 *Putra* the *Bhasma* passed all classical tests of analysis most importantly *Nishchandrata*, *Arunatwa*, *Dantagre kachkachabhava*, which are cardinal tests of analysis for *Abhraka Bhasma*. Analysis for physical and Chemical tests revealed importantly Softness and pH of 7.59 i.e. mild alkalinity. The SEM analysis of *Bhasma* shown particle size varying between 95 nm to 1.6 μ m which is very small. XRF analysis of *Bhasma* revealed decreased % of Fe, Si, K, Al than Raw *Abhraka*. In present study, the prepared *Abhraka Bhasma* has passed all classical tests of analysis indicates that it is safe for use in treatment.

KEY WORDS: *Nishchandra Abhraka Bhasma*, *Putra*, SEM, XRF, XRD analysis.

INTRODUCTION:

Bhasma Kalpana is a unique and very useful dosage form mentioned by our ancient scholars. It came into existence from the "*Rasashastriya kaala*". There is a lot mean by a *Bhasma*. *Bhasma* is a stable, Bio-available, non toxic, palatable form of any metal or mineral, only when, the drugs are processed well for *Shodhana* or *Marana* etc. as per *Ayurvedic* texts. The process before *Bhasma nirman* i.e. *Shodhana* plays very vital role in the *Bhasma nirman*, which makes the drug free from impurities and suitable for further procedures. Despite of all *Bhasmas* described in *Ayurveda*, *Abhraka Bhasma* has prime importance in classical *Ayurvedic* texts and in *Ayurvedic* treatment. The number of *Putras* described for *Abhraka* are from 1 to 1000 which is very significant than any other *Bhasma*.^[1] It has been described in

texts that, with the increase in *Putra* to *Abhraka* its properties also increases, with decrease in particle size to less than nanometers? i.e. *Sukshmatwa*. In the texts of *Ayurveda* it has been mentioned that *Nishchandrata* an important test of *Abhraka Bhasma* without passing this test one cannot use *Abhraka Bhasma* in *Ayurvedic* medicine. So, there is a need to prepare a *Nishchandra Abhraka Bhasma* by traditional method and prove it analytically by classical as well as modern parameters for its physical and chemical properties. Here an attempt has been made regarding preparation of *Abhraka Bhasma* by the traditional *Putra* method of "*Rasasara*" a very useful text in *Rasashastra*. The current study is basically focused on preparation of *Abhraka Bhasma* as per text, to establish its method of

preparation and its analysis by classical as well as modern techniques.

MATERIALS AND METHODS:

Materials:

Procurement of Basic raw materials

A) Main raw material:

ABHRAKA: *Abhraka* of acceptable quality was procured from Zarkhand and Authenticated as per Classical and modern methods.

B) Raw materials needed for *Shodhana*:

1. *Triphala*
2. *Water*

C) Raw materials needed for *Dhanyabhraka Nirmana*:

1. *Dhanya(Shali)*
2. *Kambal* or jute cloth
3. *Water*

D) Raw materials needed for *Marana*:

1. *Dhanyabhraka*
2. *Guda*
3. *Dadhi*(curd)
4. *Chincha drava*

Equipments required:

1. Weighing machine
2. *Khalva Yantra*
3. *Putra Yantra*
4. Blower
5. *Upala*
6. *Sharava*
7. *Matakapada*
8. *Multani Mruttika*

Methods:

The current study is divided into main two parts. Pharmaceutical and Analytical study.

Pharmaceutical Study:

A. *Abhraka Shodhana*^[2]:

For *Shodhana* of *Abhraka*, it was weighed. As per reference of *Sharangdhara Samhita* i.e. *Triphala* and *water* were taken into a vessel in 1:16 proportions and the mixture was allowed to heat till decoction of 1/8th part was remained in the vessel. Later it was filtered through cloth and this prepared *Triphala Kwatha* was used for *Shodhana*.

The *Abhraka patra* were made red hot over ignited coal and dipped into the prepared *Triphala Kwatha*. This process was repeated for 7 times and for each time fresh *Triphala Kwatha* was used.

- Wt. of raw *Abhraka* : 150 gm
- Total Loss during *Shodhana* : 43 gm
- Final yield of *Shuddha Abhraka* after *Shodhana* : 107 gm

B. *Dhanyabhraka Nirman*^[3]:

The prepared *Shuddha Abhraka* and 1/4th quantity of *Dhanya(Shali)* were taken into *Kambal* cloth, tied well and made into *pottali* form. It was allowed to be immersed into water filled vessel for three days. After three days it was squeezed into the same water containing vessel so as to get fine *Dhanyabhraka* particles which comes through the pores of *kambal cloth*.

These particles were collected carefully from water and dried well in sunlight.

- Final yield of *Dhanyabhraka* was : 92 gm

Preparation of *Abhraka Bhasma* according to "*Rasasara*"^[4]:

Ingredients:

1. *Dhanyabhraka* : 40 gm
2. *Guda* : 40 gm QS
3. *Dadhi*(curd) : 40 gm QS
4. *Chincha drava* : 40 ml QS

Procedure:

- The *Dhanyabhraka* 40 gm was taken in *Khalva yantra*.
- *Dadhi* 40gm, *Guda* 40 gm and *Chincha Drava* 40 ml were added to it respectively and triturated for 6 hours till the mixture gained consistency of being *Chakrika*.
- Then it was made into *chakrita* form and dried.
- The dried *Chakrika* were kept in *Sharava Samputa* and smeared with *Matakapada* and *Sandhibandhana* done.
- The *Sharava Samputa* as prepared above was allowed to dry.
- The pit utilised for *Gajaputa* was as per dimensions in text of *Rasashastra*.
- The 2/3rd of the portion of *Gajaputa* was filled with *Upala* and over which the *Sharava Samputa* as prepared above was kept. It was then covered with *Upala* to cover remaining 1/3rd portion of *Gajaputa*.
- A tip of pyrometer was kept at the base of *Sharava Samputa*.
- Further it was subjected to ignition.
- During the *Gajaputa* temperature was recorded.
- The *Gajaputa* which was ignited allowed to *Swangasheetikarana*.
- After *Swangasheetikarana* the *Sharava* was removed from *Putra*.
- The *Chakrika* were observed for results.

Procedure of Bhavana:

The *Bhavana* given during the procedure was with uniform pressure in granite *Khalva Yantra*.

Chakrika:

The *Chakrika's* made was of uniform size and dried completely in a shade.

Sharava Samputa:

The dried *Chakrika's* were spread uniformly in the *Sharava Samputa and Sandhibandhana* was made by subjecting it to 2 layers of *Matakapada*.

Upala used:

The *Upala* used during process were measured before subjecting to *Putra*. The average Wt. of *Upala* was 230 gm. The no. of *Upala's* were counted which were required to fill to *Putra*.

Measurement of temperature:

A digital pyrometer was used during process of *putra*. The tip of pyrometer was kept at the base of *Sharava Samputa* during arrangement of *Upala* for *Putra*, to take proper temperature readings. Readings were taken at the interval of 30 minutes.

The procedure as described above was repeated for each *Putra till Siddhi Lakshanas's* observed.

After completion of the prepared *Abhraka Bhasma* it was analyzed by classical as well as modern parameters to establish its authenticity.

The classical methods of analysis were undergone as par text. The detailed description on it is given below in observations section.

The modern methods of analysis like physical, chemical, XRD, XRF, SEM were utilized to establish classical methods on the base of modern science. These tests and their respective observations are described below in observations section.

OBSERVATIONS AND RESULTS:**Pharmaceutical:**

During the course of study the important observations recorded were described below in a divided manner.

Some important observations recorded during the process of *Bhavana*:

- There was increase in Wt. of *Chakrika* observed after 1st *Putra* till 3rd *Putra*.
- The total *Dadhi* (Curd) required for the process was 600 gm.
- The total *Guda* (Jaggery) required for the process was 560 gm.

- The total *Chincha Drava* required for the process was 600 ml.
- The time required for *Bhavana* during process was average 4-8 hrs.
- The average time required for drying *Chakrika* was 20 hrs.

Some important observations recorded during the process of *Gajaputa*:

- The peak in temperature was observed after half to one hour after *Putra* was ignited and it was maintained for 1 hr.
- The *Upala* were brilliant red after peak temperature.
- The period required for *Swangasheetikarana* was 21 hrs.

It was observed after each *Gajaputa* that:

- The colour of *Chakrika* was becoming brown and dark successive *Putra*.
- The *Chakrika's* were becoming lighter and Soft in touch than earlier with successive *Putra*.
- The weight of *Chakrika's* was seen increased than earlier after 1st, 2nd and 3rd *Putra*.
- The weight of *Chakrika's* was seen decreased than earlier with successive *Putra* after 3rd *Putra*.

Analytical:**Analysis of Abhraka Bhasma by classical parameters after each Putra:****1. Nishchandravta:**

The prepared *Bhasma* was triturated well and observed for any *Chandrika* (metallic lustre), also pinch of *Bhasma* was rubbed between two fingers and observed again for *Chandrika* (metallic lustre).

Observations:

- The *Abhraka Bhasma* was totally *Nishchandra* after 18th *Putra*.

2. Arunatva:

The prepared *Bhasma* was triturated well and observed for *Aruna* (redish brown colour) which is characteristic colour of *Abhraka Bhasma*.

Observations:

- The *Abhraka Bhasma* was totally *redish brown* in colour after 18th *Putra*.

3. Rekhapurnatva:

The pinch of *Bhasma* was rubbed between thumb and index finger and observed for *Rekhapurnatva*

i.e. whether it enters into the lines of fingers or not.

Observations:

- The *Abhraka Bhasma* passed this test after 8th *Putra*.

4. Varitaratva:

Clean water was taken in a glass beaker and was allowed to stand. The pinch of *Bhasma* was sprinkled over it. Floating of *Bhasma* over water was observed.

Observations:

- The *Abhraka Bhasma* passed this test after 12th *Putra*.

5. Unam:

Clean water was taken in a glass beaker and was allowed to stand. The pinch of *Bhasma* was sprinkled over it. Then few grains of rice were placed over floating *Bhasma*. Then observed for, the grain of rice floats on water along with

Bhasma particles.

Observations:

- The *Abhraka Bhasma* passed this test after 12th *Putra*.

6. Niswadu:

A pinch of *Bhasma* was placed over tongue and perceived for taste.

Observations:

- The *Abhraka Bhasma* passed this test after 4th *Putra*.

7. Dantagre kachkachabhava:

A pinch of *Bhasma* was placed in mouth and tried to bite it with teeth, there is no any sensation like *Kachakacha* (particles sensation) during if *kachkachabhava*(no particles sensation).

Observations:

- The *Abhraka Bhasma* passed this test after 18th *Putra*.

The detailed table of analytical observations recorded after each *Putra* are as follows in table 1.

Table 1

Characteristics of *Abhraka Bhasma* after Each *putra*

<i>Putra</i> No.	<i>Nishchandravta (lustreless)</i>	<i>Arunatva (Redish brown colour)</i>	<i>Rekhapurnatva</i>	<i>Varitaratva</i>	<i>Unam</i>	<i>Niswadu</i>	<i>Dantagre kachkachabhava</i>
1	18 th <i>Putra</i>	18 th <i>Putra</i>	8 th <i>Putra</i>	12 th <i>Putra</i>	12 th <i>Putra</i>	4 th <i>Putra</i>	18 th <i>Putra</i>

ANALYSIS OF ABHRAKA BHASMA BY MODERN PARAMETERS:

Physical analysis of *Abhraka Bhasma*:

The *Abhraka Bhasma* prepared was analyzed for following organoleptic parameters as in table 2.

Table 2

Sr. No.	TEST	<i>Abhraka Bhasma</i>
1	Descriptioin	Fine Powder
2	Colour	Redish
3	Odour	No
4	Taste	No
5	Touch	Soft

Chemical Analysis of *Abhraka Bhasma*:

The *Abhraka Bhasma* prepared was analyzed for following chemical parameters as in table 3.

Table showing chemical analysis of *Abhraka Bhasma*

Table 3

Sr. No.	Test Name	Result
1.	pH (1% Solution)	7.59
2.	Loss on Drying at 105°C	0.053 %
3.	Total Ash	99.75 %
4.	Acid Insoluble Ash	77.6 %
5.	Water Soluble Ash	15.1 %

XRD (X-Ray Diffraction) analysis of Raw *Abhraka* and *Abhraka Bhasma*:

The XRD analysis was done on Pan Analytical XRD analyser and the identification of phases obtained in XRD analysis were carried out on the software Database - Pananalytical Xpert Highscore having JCPDS database, in Solapur University.

Table showing Phases of Raw *Abhraka* obtained by XRD analysis.**Table 4**

Sr. No.	Drug Name	Major Phase	Minor Phase
1	Raw <i>Abhraka</i>	Biotite	Biotite-1\ITM\RG
3	<i>Abhraka Bhasma</i>	Biotite-4\ITM#3\RG, titanian	1. Kaersutite, 2. Annite-1\ITM\RG

Results of XRD: Raw *Abhraka*

- The Major phase identified by XRD analysis was **Biotite**.

Results of XRD: *Abhraka Bhasma*

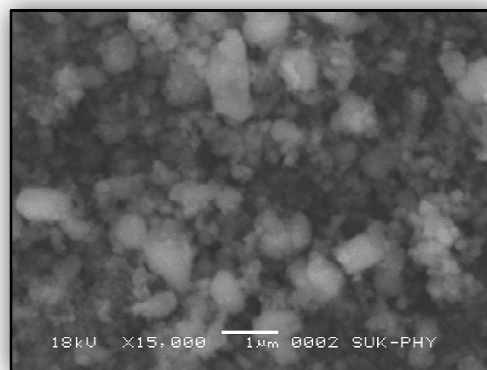
- The Major phase identified by XRD analysis was **Biotite-4\ITM#3\RG titanian**.

Elemental Analysis of Raw *Abhraka* and *Abhraka Bhasma* by Modern parameter XRF:[Table 5]**Table 5**

	RAW ABHRAKA	ABHRAKA BHASMA
ELEMENTS	MASS [%]	MASS [%]
Fe	50.707	37.052
O	32.911	32.796
K	5.884	3.116
Si	5.549	2.706
Al	2.501	0.956
Ti	1.515	1.347
Mn	0.565	0.278
Zn	0.295	-
Nb	0.048	-
V	0.023	
Ca	-	15
P	-	2.338
Cr	-	0.099

SEM analysis of ABHRAKA BHASMA**Results:**

When *Abhraka Bhasma* was analyzed under SEM at X 15000, it revealed particle size which was varying from size 95 nm to 1.6 μ m. This suggests the size of particles in *Abhraka Bhasma* is very small.

**At magnification of X 15000****DISCUSSION:**

After completing the study following points were concluded.

- The process of *Shodhana and Dhanyabhraka* plays vital role in further process of *Marana*. It helps to reduce particle size of *Bhasma*.
- "*Nishchandrata*" the most important *Siddhi Lakshna* of *Abhraka Bhasma* is obtained in *18 Puta*. Where *Arunatwa* obtained in *18 Puta*.
- The pH of the *Abhraka Bhasma* observed 7.59 which is less alkaline.
- The major phase identified in XRD analysis of raw *Abhraka* is Biotite and in *Abhraka Bhasma* it is Biotite-4\ITM#3\RG titanian.
- The % of Silicon (Si) is low in *Abhraka Bhasma* than Raw *Abhraka*, which suggests that Silicate form in *Abhraka* gets destructed hence became *Nishchandra*.
- The % of Aluminium(Al) is low in *Abhraka Bhasma* than Raw *Abhraka*, It suggests that *Abhraka Bhasma* may be safe due to this.
- The increased % of Calcium, Phosphorus may be due to Curd, *Chincha*(Tamarind) used
- The particle size of *Abhraka Bhasma* much more less (95nm) to (1.6 μ m).
- Analytically, both classical and modern methods suggest that *Abhraka Bhasma* prepared by the current traditional method is safer because it has passed all Classical tests

successfully and due to decreased % of Aluminium, Silicon etc.

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