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Research Article

PREPARATION AND PHYSICO-CHEMICAL ANALYSIS OF NISHCHANDRA ABHRAKA BHASMA PREPARED BY SINGLE PUTA METHOD.

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ABSTRACT:

Abhraka bhasma is a very important *bhasma* in *Ayurveda*. There are lot of process mentioned in classical *Ayurvedic* texts to make *Abhraka Bhasma*. There are difficulties in preparation of *Nishchandra Abhraka Bhasma* even after giving 30-40 *Putra*, which is main important *Siddhi Lakshana* of *Abhraka Bhasma*. But as per reference of recent text from *Rasashastra*, *Nishchandra Abhraka bhasma* can be prepared in single *Putra*. The process involves use of *Sarwarthakari Bhrashti* with mineral coal as a fuel and a *Marana dravya* as *Suryakshara* and *Jaggery*. When *Putra* was given, the *Bhasma* becomes "*Nishchandra*" and when further subjected to *Gajaputra* the *Bhasma* becomes *Aruna* (reddish brown) in colour. The elemental analysis of this *Bhasma* revealed decreased percentage of silicon and Aluminium. The analyzed particle size of this *Bhasma* is fine of 286 nm to 2.3 μ m. So, with two *Putra* only a less expensive but useful *Abhraka Bhasma* can be prepared by this method.

KEY WORDS: *Abhraka Bhasma*, *Nishchandratwa*, *Suryakshara*, *Putra*, *Ayurveda*, *Rasashastra*, *Rasayansara*.

INTRODUCTION:

Abhraka is described under the heading of *Maharasa* in *Rasashastra*. *Abhraka* holds prime importance in *Ayurveda*, due to its miraculous properties. *Abhraka* is used to make *Parada baddha*, no other *rasa dravya* holds this property. *Abhraka bhasma* is a very important *bhasma* in *Ayurveda*. In the texts of *Rasashastra* it has given prime importance. For treatment of common diseases *Abhraka bhasma* with 20-30 *Putra* is suggested and *Abhraka bhasma* with 100 -1000 *Putra* is suggested for use as *Rasayana*.¹ With increasing number of *Putra* this *bhasma* becomes more useful and the particle size reduces to much lower size about 30 nanometres. In classical texts of *Rasashastra* there have been mentioned the preparation of *Abhraka Bhasma* by different methods. It includes use of organic and inorganic

materials as a *marana dravya* for making *bhasma*. It is most useful *bhasma* (drug) in *Ayurveda*. As *Abhraka* is Multimineral and Aluminium silicate it is difficult to break the silica bond in it. There are difficulties in preparation of *Nishchandra Abhraka Bhasma* even after giving 30-40 *Putra*, which is main important *Siddhi Lakshana* of *Abhraka Bhasma*. But in "*Rasayansara*" the text of *Rasashastra*, this process has been mentioned which provide *Nishchandratwa* to *Abhraka bhasma* in single *Putra*. Hence, this advanced method from texts of *Rasashastra* is taken here for study.

The process of *Bhasmikan* involves several common processes, *Bhavana*, *Mardana*, and *Marana*. The significance of these processes is not only to prepare a chemical entity but also a bio-

available form of drug which gives miraculous properties. This ultimate chemistry of metallic transformations was very well known to our *Aacharyas*. This is a challenge to today's modern science to simplify and present this ultimate knowledge in current scientific form. This is difficult to correlate *Ayurvedic* parameters with modern science but an attempt has been made here to *Abhraka Bhasma*.

So, this is the era of work on the preparation of *Abhraka bhasma* by different method, its analysis by classical as well as modern methods and establishing its quality along with its cost effectiveness.

AIM AND OBJECTIVES:

AIM:

To prepare *Nishchandra Abhraka bhasma* and Physico-chemical Analysis of final product.

OBJECTIVES:

Preparation of *Nishchandra Abhraka Bhasma* according to "*Rasayansara*"

Physico-chemical Analysis of *Abhraka Bhasma* prepared.

REVIEW OF LITERATURE:

*Grahyagrahyatwa of Abhraka*²:

When heated over agni, No change occurs in it, it remains as it is like *Vajra*. This type of *Abhraka* is suggested for use in treatments.

So, the acceptable variety of *Abhraka* is *krusna* & *Vajra* possesses following properties –

Properties of *Grahya Abhraka*:

<i>Nilanjanopam</i>	: black like <i>Nila Anjan</i>
<i>Snigdham</i>	: smooth and shiny surface or appearance
<i>Bharapurnam</i>	: heavy in weight.
<i>Nirmocchyapatram</i>	: Its layers can be easily separated by hands.
<i>Mrudulam</i>	: Soft in Touch

Krushna Vajrabhraka having these properties is accepted.

Mica:

The word "mica" is derived from the Latin word mica, meaning a crumb, and probably influenced by micare, to glitter. The mica is a group

of sheet silicates (phyllosilicate) that can be made into flexible or brittle sheets. All are monoclinic, with a tendency towards pseudo hexagonal crystals, and are similar in chemical composition. The nearly perfect cleavage, which is the most prominent characteristic of mica, is explained by the hexagonal sheet-like arrangement of its atoms. Micas are among the most common and abundant minerals in the Earth crust: 4.5% by volume. They are widespread in most if not all metamorphic rocks (abundance: 11 %), and common also in sediments and sedimentary and igneous rocks.³

Concept of *Marana*:⁴

The process that involves levigation of purified *Loha, dhatu, rasa, maharasa* etc. with *swarasa, Kwatha* etc. and further treatment of heat (*puta*) to make *Bhasma* is named as *Marana*.

Marana is the process which converts inorganic materials like minerals, metals (*Loha*), into bio-available form. It plays very important role in *Dehavada*.

Prerequisite of *Marana*:

- The drug which is subjected for *Marana* in *Shuddha*(pure) form.
- The *Shuddha* drug is subjected for *Bhavana* (levigation) and made into *Chakrika* form.
- *Chakrika* are allowed to dry completely.
- Dried *Chakrika* are subjected to keep in *Sharava Samputa* and smeared with *Matakapada*, followed by drying it.

The above processed *Sharava Samputa* is then kept in *Putra* (It is different for each drug) and subjected to heat i.e. the process of *Marana*.

Prohibition Regarding *Abhraka Bhasma*:

Abhraka Bhasma which is *Ashuddha, Sachandrika* (with lustre) is strictly prohibited in texts. It can produce toxic symptoms like *Prameha and Agnimandya*, Intestinal perforation and death by intestinal perforation etc.

Important *Siddhi Lakshana of Abhraka Bhasma*:

As in case of *Abhraka Bhasma, Nishchandratwa* is important classical analytical test. If improper analysis regarding *Nishchandratwa* test is done then it may produce a drug which could be

harmful for human use. So, any prepared *Abhraka Bhasma* should pass this test.

MATERIALS AND METHODS:

A) Main raw material:

1. ABHRAKA

About 1 kg of *Abhraka* in flakes form was procured from Zarkhand and Authenticated as per Classical Ayurvedic norms and XRD.

B) Raw materials needed for *Shodhana* and *Marana*:

1. *Triphala*

Triphala was procured from local Ayurvedic herb trader and authenticated.

2. *Dhanya (Shali)*

Dhanya (Shali) was procured from our college pharmacy and authenticated.

3. *Guda*

An Organic *Guda (Jaggery)* was procured from Local market and authenticated.

4. *Suryakshar (KNO₃)*

Suryakshar (KNO₃) was procured from local Ayurvedic trader in and authenticated.

PREPARATION OF ABHRAKA BHASMA ACCORDING TO RASAYANA SARA^{5,6}:

1. *Dhanyabhraka* : 40 gm (2 part)
2. *Guda* : 20 gm (1 part)
3. *Shuddha Suryakshara (KNO₃)* : 20gm (1 part)

Equipments required:

4. Weighing machine
5. *Khalva Yantra*
6. *Sarwarthakari Bhrashti*
7. Blower
8. Mineral Coal
9. Wooden coal
10. Clay pot
11. *Matakapada*
12. *Multani Mruttika*

Procedure:

Guda 20 gm (1 part) + *Shuddha Suryakshara* 20 gm (1 part) was taken in *Khalva Yantra* and triturated well. *Dhanyabhraka* 40 gm (2 parts) was added to the mixture and triturated well till the mixture become homogeneous. The above mixture was dried well for a day. Later it was placed in a Clay pot & *mudra (matkapad)* was done and allowed to dry. 1 Kg of wooden coal was spread over the iron

mesh in the *Sarwarthakari Bhrashti*, for easy burning of fuel. 2 Kg of mineral coal was spread over the wooden coal in the *Sarwarthakari Bhrashti*.

After drying of clay pot, it was subjected to keep above the spread mineral coal in the *Sarwarthakari Bhrashti*. This is the point where tip of pyrometer kept touched for temperature record. Remaining 3 kg of mineral coal was spread beside and above the clay pot, above which 1 kg of wooden coal spread for proper ignition.

The *Sarwarthakari Bhrashti* was ignited with the help of fired wood at the base. After few minutes fired wood were removed and blower was started to ignite the coal. Blower was kept on, till the fuel (coal) not ignited properly. During the process temperature was recorded properly. After 18 Hrs of heating and *Swangasheetikarana*, the Clay pot was removed from the *Bhrashti* and observed for changes. The Clay pot was broken at its base but the *Bhasma* was preserved.

The obtained *Bhasma* was triturated well in *Khalva Yantra* and observed for changes.

Precaution:

- The *Guda* and *Suryakshara* along with *Dhanyabhraka* was triturated well so as to make homogeneous mixture.
- Drying of it was done properly.
- Clay pot should be well smeared with *matakapada* to avoid breaking during heating.
- Pyrometer tip was placed at the base of pot to get correct temperature pattern.
- Coal was spread even to provide better heat from all sides.

Procedure for removal of *Kshariyatwa* of *Bhasma*:

Due to use of *Suryakshara*, *Bhasma* formed was *kshariya*. To remove the *kshariyatwa* it was subjected to following process.

- The *Abhraka Bhasma* obtained was triturated and kept in water for a prahar (3 hrs) to remove its *kshariyatwa* (sourness) due to *Suryakshara (KNO₃)*
- This process was repeated till *kshariyatwa* is reduced.
- *Kshariyatwa* was assessed by keeping some *Bhasma* over tongue.

GAJAPUTA (PUTA No. 2)⁷:

Raw Materials required:

1. *Nishchandra Abhraka Bhasma*
As obtained above : 35 gm (2 parts)
2. *Arka Patra Swarasa* : 60 ml (QS)

Equipments required:

1. Weighing machine
2. *Khalva Yantra*
3. *Upala*
4. *Gajaputa*
5. *Sharava*
6. *Matakapada*
7. *Multani mruttika*

Procedure:

The *Nishchandra Abhraka Bhasma* obtained above was triturated with *Arka Patra Swarasa* for 6 hours. It was made into *chakrika form*, dried them & *vidhivat* One *Gajaputa* was Given. After *Swangasheetikarana* the *Sharava* was removed from *Putra*. The *Chakrika* were become completely red coloured. Later *Chakrika* were triturated in *Khalva Yantra* which gave brown red coloured *Abhraka Bhasma*.

OBSERVATIONS AND RESULTS:**Observations during 1st Puta in Sarwarthakari Bhrashti:**

- The temperature peaks observed during procedure were too high about 1200°C for 3 Hrs.
- Due to higher temperature the clay pot was broken at its base.
- The *Bhasma* powder observed at the base of clay pot was slight red, yellow, greyish in colour and very light in weight.
- When the powder was triturated in *Khalva Yantra* it was completely "**NISHCHANDRA**" and was greyish black in colour.

Total No. of mineral coal used : 5 Kg
Total No. of wooden coal used : 2 Kg
Total time required for *Putra* : 18 Hrs

Observations after 2nd Puta (Gajaputa):

- While addition of *Arka Patra Swarasa* to *Nishchandra Abhraka Bhasma* it was green in colour.
- After some time of trituration the colour changed to red.
- The colour of *Chakrika* was Dark Brown red.

- The weight of final product was 32 gm
- Total No. of *Upala* used : 25 Kg (approx.)
- Total time required for *Putra* : 16 Hrs

Description of Chakrika after 1st Puta in Sarwarthakari Bhrashti and 2nd Gajaputa:

Putra No.	Colour	Consistency	weight gm
1	Greyish Black	Light in wt.	35
2	Brown Red	Light in wt.	32

Abhraka Bhasma R. Y. S. - I after 2 Puta:

- The final product obtained was 32gm in wt i.e. 80% out of 40gm *Dhanyabhraka*.
- The total loss in *Abhraka* during the *Rasayana Sara (Method - I)* was 8gm. i.e. 20%

Analysis of Abhraka Bhasma by classical parameters:**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* of was totally *Nishchandra* after first *Putra*.

Arunatva:

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

Observations:

- The *Abhraka Bhasma* of was totally *reddish brown* in colour after Second *Putra*.

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* prepared by passed this test after Second *Putra*.

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* prepared by did not pass this test after Second *Putra completely*. Not all *Bhasma* particles were floating over surface of water.

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* prepared did not pass this test after Second *Putra completely*.

Niswadu:

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

Observations:

- The *Abhraka Bhasma* prepared passed this test after Second *Putra completely*.

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* prepared by did not pass this test after Second *Putra completely*.

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

Characteristics of *Abhraka Bhasma* after Each *putra*

<i>Putra</i> No.	<i>Nischandratva</i> (lustreless)	<i>Arunatva</i> (Redish brown colour)	<i>Rekhapurnatva</i>	<i>Vari-taratva</i>	<i>Unam</i>	<i>Niswadu</i>	<i>Dantagre kachkachabhava</i>
1	Yes	No	No	No	No	No	No
2	Yes Completely Nisc handra	Yes Complete ly brown in colour	Yes	Mild Varitar	Mild Unam	Yes	Mild Dantagre kachkacha-bhava

Physico- Chemical analysis of *Abhraka Bhasma*:

organoleptic parameters.

Sr. No.	TEST	ABHRAKA BHASMA
1	Descriptioin	Fine Powder
2	Colour	Redish Brown
3	Odour	No
4	Taste	No
5	Touch	Soft

Table showing chemical analysis of *Abhraka Bhasma*

Sr. No.	Test Name	Result
1.	pH (1% Solution)	8.95
2.	Loss on Drying at 105°C	0.046 %
3.	Total Ash	99.86 %
4.	Acid Insoluble Ash	78.6 %
5.	Water Soluble Ash	17.3 %

Analysis of *Abhraka Bhasma* by XRD:

Compound Name	Chemical Formula
Muscovite	Major Phase
Biotite-4\ITM#3\RG, titanian	Minor Phase
Annite-1\ITM\RG	Minor phase

Results of XRD:

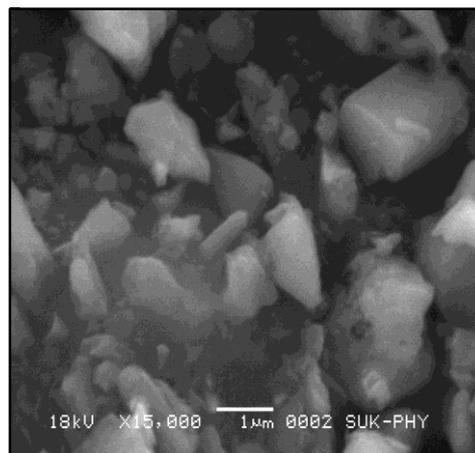
- The Major phase identified by XRD analysis was Muscovite.
- The minor phases identified were Biotite-4\ITM#3\RG titanian and Annite-1\ITM\RG.

Elemental Analysis of *Abhraka Bhasma* by Modern parameter XRF:

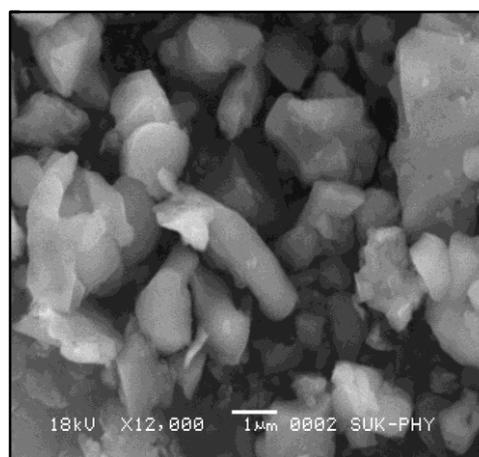
Elemental Analysis of *Abhraka Bhasma* was done on XRF analyzer.

Table showing Elemental percentage obtained of *Abhraka Bhasma RYS I* on XRF analyzer.

	Raw <i>Abhraka</i>	<i>Bhasma</i>
ELEMENTS	MASS [%]	MASS [%]
Fe	50.707	43.47
O	32.911	29.837
K	5.884	18.88
Si	5.549	3.526
Al	2.501	1.68
Ti	1.515	1.349
Mn	0.565	0.433
Zn	0.295	-
Nb	0.048	-
V	0.023	0.11
Cu	-	0.374
S	-	0.342

Particle size analysis of *Abhraka Bhasma* by Modern parameter SEM:**Image showing particle size obtained of *Abhraka Bhasma* on SEM.**

At magnification of X15000



At magnification of X12000

Results:

When *Abhraka Bhasma RYS I* was analyzed under SEM, it revealed particle which was varying from size 286 nm to 2.3 μm at magnification of X15,000.

DISCUSSION

Under the heading discussion, the important points covered under presented study are discussed,

1. Pharmaceutical study
2. Analytical study

PHARMACEUTICAL STUDY**1. Authentication Of *Abhraka*:**

After attempting classical method of analysis it was confirmed that provided sample was of *Krushna Vajrabhraka* type.

2. *Triphala Kwatha*:

- *Triphala Kwatha produced* was bearing its natural brownish turbid colour.

- Its taste was *Kashaya*.
- The average *Triphala Kwatha* obtained during the process was 190 ml

3. *Abhraka Shodhana*:

- The Total Loss during *Shodhana* was 43 gm out of 150 gm raw *Abhraka*
- Final yield of *Shuddha Abhraka* after *Shodhana* : 107 gm

4. *Dhanyabhraka Nirman*:

- *Dhanyabhraka* particles obtained in the process were become too soft, shiny and fine as compared to *Shuddha Abhraka*.
- The total *Dhanyabhraka* obtained during process was 920gm

5. *Suryakshara Shodhana*:

- The crystals of *Suryakshara* obtained were typical *Shalaka* like.
- The *Shuddha Suryakshara* obtained was 47gm out of 50gm.

1. PREPARATION OF ABHRAKA BHASMA ACCORDING TO RASAYANA SARA:

Abhraka Bhasma Puta No. 1 in Sarwarthakari Bhrashti:

- The temperature peaks observed during procedure were too high 1200°C for 3 Hrs.
- *Abhraka Bhasma* of *Rasayana Sara (Method - I)* was completely "*NISHCHANDRA*" and was greyish black in colour.

Abhraka Bhasma in Gajaputa (Putu No. 2) :

- *Abhraka Bhasma* prepared was completely "*NISHCHANDRA*" and was Brown red in colour. Also it was Light in wt., after 2 *puta*.
- The final product obtained was **32gm in wt i.e. 80%** out of 40gm *Dhanyabhraka*.
- The total loss in *Abhraka* during the *Rasayana Sara (Method - I)* was **8gm. i.e. 20%**

Description of *Chakrika* after 1st *Putu* in *Sarwarthakari Bhrashti* and 2nd *Gajaputa*:

Putu No.	Colour	Consistency	weight gm
1	Greyish Black	Light in wt.	35
2	Brown Red	Light in wt.	32

2. Analysis of *Abhraka Bhasma* by classical parameters:

The detailed table of observations recorded after each *Putu* are as in following tables.

- *Abhraka Bhasma* prepared was *Nishchandra, Aruna, Rekhapurna, Niswadu* after 2 *Putu*.
- *But the Abhraka Bhasma* did not pass the *Varitaratwa, Unam, Dantagre kachkachabhava* test completely.

Results of XRD: *Abhraka Bhasma* The Major phase identified by XRD analysis was **Muscovite**.

- The minor phases identified was *Biotite-4\ITM#3\RG* titanian and *Annite-1\ITM\RG*.

RESULTS:

The elemental analysis of final products by XRF revealed

The Fe % of raw *Abhraka* was 50.70 %, while that of *Abhraka Bhasma* in XRF is 50.70 %. The "O" % of raw *Abhraka* was 32.91 %. While the "O" % of *Abhraka Bhasma* was 29.83 which is decreased as compared to RA %,

The "K" % of RA was 5.88 %. The "K" % of *Abhraka Bhasma RYS I* in XRF was increased to **18.88** as compared to RA % which might be due to potassium from *Suryakshara (KNO3)*.

The percentage of "Si" was decreased in *Bhasma* as compared to percentage of raw *Abhraka* which might be an indication of increased *Nishchandrata*(~metallic lustre). The percentage of "Al" was decreased in *Bhasma* as compared to percentage of raw *Abhraka* which might be an indication of decreased toxicity. While there is no major change in percentage observed in "Ti" of both the *Bhasma*.

The percentage of "Mn" was decreased in *Bhasma* as compared to percentage of RA %. The Zn and Nb which were present in RA were not present in *Bhasma*.

There are some impurities "As", "S", "Cu" observed in minor quantities both the *Bhasma's* which should not be present in *Abhraka Bhasma*. These may be due to contamination from *Khalva, Samputa* used or other apparatus used during process. (It should be avoided).

Particle size Analysis of by SEM:

When *Abhraka Bhasma* was analyzed under SEM, it revealed particle size which was varying

from size 286 nm to 2.3 μ m at magnification of X15,000.

SUMMARY:

In Pharmaceutical study the drugs required for *Shodhana* and *Marana* were collected and authenticated. The raw *Abhraka* was also authenticated as per the classical and modern techniques. The process of *Shodhana* and *Dhanyabhrakarana* was done as per *Rasatarangini*. The process of *Marana* for was performed as per the reference from *Rasayansara*. In Analytical study, the *Bhasma* prepared was analyzed by classical parameters i.e. *Nishchandrata*, *Arunatwa*, *Rekhapurnatwa* etc. along with modern analytical parameters i.e. Physical and chemical analysis, for phase identification (XRD), elemental % (XRF), particle size (SEM).

To prepare *Abhraka Bhasma* by current method required temperature of about 1200°C was seen sufficient. The *Abhraka Bhasma* prepared by this method became *Nishchandra* in one *Putra* only. The pH of this *Bhasma* was 8.95. The major phases identified in XRD analysis of raw *Abhraka* is Biotite and in *Abhraka Bhasma* prepared it is.

The percentage of "Si" was decreased in *Bhasma* as compared to percentage of raw *Abhraka* which might be an indication of increased *Nishchandrata* (~metallic lustre). The percentage of "Al" was decreased in *Bhasma* as compared to percentage of raw *Abhraka* which might be an indication of decreased toxicity.

The minimum particle size analyzed for *Abhraka Bhasma* is 286 nm to 2.3 μ m which is very fine.

The pharmaceutical and analytical study performed suggests that the *Abhraka Bhasma* prepared by *RYS I* is cost effective, easy to prepare and requires less time.

CONCLUSION

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*.
- For the preparation of *Abhraka Bhasma* by this method, the maximum temperature of 1200°C in *Sarvarthakari Bhrashti* for 3 hrs required.
- "*Nishchandrata*" the most important *Siddhi Lakshna* of *Abhraka Bhasma* is obtained in in single

Putra only. Where *Arunatwa* obtained in in 2 *Putra* only. The pH of The *Abhraka Bhasma* prepared by this method was 8.95 which is more alkaline.

- The % of Silicon (Si) is comparatively low than Raw *Abhraka*, which suggests that Silicate form in *Abhraka* gets destructed hence became *Nishchandra*. The % of Aluminum (Al) is comparatively low in this *Abhraka Bhasma* Than raw *Abhraka*. The particle size of prepared *Abhraka Bhasma* is (286nm) to (2.3 μ m) which is very fine.

But, the *Abhraka Bhasma* prepared by this method is very cost effective and easy to manufacture.

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