INTERNATIONAL JOURNAL OF
Clinical and Pharmaceutical Innovations
An International Peer Reviewed Open Access Journal

Research Article

ISSN (Online): 3142-8665
CODEN (USA): IJCPSM

2026, Volume 1, Issue 5, Page No: 319-333.

PHARMACEUTICAL AND ANALYTICAL EVALUATION OF *ABHRAKA BHASMA*

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Article Info: **Received:** 21 June 2026, **Revised:** 11 July 2026, **Accepted:** 01 August 2026

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DOI: https://doi.org/10.5281/zenodo.22070678

Citation:
Hemlata[1]*, Neha Arya[2], Ajay Kumar[3], Shivanshi Pal[4]. (2026). Pharmaceutical And Analytical Evaluation Of *Abhraka Bhasma*. International Journal of Clinical and Pharmaceutical Innovations, 1(5), 319-333.

ABSTRACT

Abhraka Bhasma, a classical Ayurvedic herbo-mineral preparation derived from purified mica through the process of Shodhana (purification) and Marana (incineration), has been widely used in traditional medicine for the management of respiratory, digestive, reproductive, and metabolic disorders. Despite its long-standing therapeutic use, standardization of Bhasma preparations remains a challenge due to variability in raw material, processing methods, and the number of Puta cycles employed. The present study was undertaken to prepare *Abhraka* Bhasma following classical Ayurvedic pharmaceutical procedures and to evaluate it through both traditional and modern analytical parameters in order to establish reproducible quality standards. Raw *Abhraka* was subjected to Shodhana using specified media, followed by Bhavana (levigation) with prescribed herbal juices, and repeated Marana through multiple Puta cycles until classical endpoints of Bhasma Pariksha—including Varitara, Rekhapurnatva, Nishchandratva, and Nirdhuma—were achieved. The final product was analyzed using modern physicochemical and instrumental techniques such as loss on drying, pH, ash values, particle size analysis, X-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), Fourier transform infrared spectroscopy (FTIR), and atomic absorption/ICP-based elemental analysis to determine phase transformation, particle morphology, elemental composition, and heavy metal safety limits. The results confirmed successful conversion of crystalline mica silicate into a stable oxide form with sub-micron particle size, absence of characteristic lustre, and heavy metal content within permissible limits as per the Ayurvedic Pharmacopoeia of India. The study demonstrates that integration of classical pharmaceutical processing with modern analytical validation provides a reliable framework for the standardization, quality control, and safety assurance of *Abhraka* Bhasma, supporting its continued therapeutic application.

KEYWORDS: *Abhraka* Bhasma, Marana, Shodhana, physicochemical evaluation, XRD, standardization, Ayurvedic Rasashastra.

INTRODUCTION

This definition reflects *Ayurveda's* holistic vision of health, encompassing not just the physical body but also mental, emotional, and spiritual well-being. Its purpose extends beyond the mere treatment of disease to encompass the preservation of vitality, protection of sensory faculties, promotion of longevity, and assurance of a peaceful existence and death. Central to achieving this state of positive health is the practice of *Rasayana*, or rejuvenation therapy, as emphasised in *Ayurveda*. Within *Rasa Shastra*, specially processed metals and minerals—mercury being of particular importance—are utilised to attain *Deha Siddhi*, representing the ideal state of health and holistic well-being.[1]

Rasashastra is an important branch of *Ayurveda*, specialising in Ayurveda pharmaceutics with herbs, metals and minerals known as *Rasaushadhis*. The internal administration of all *Rasaushadhis* became possible because of the knowledge of pharmaceutical technology of converting metals and minerals into *Bhasmas. Bhasmas* are unique *Rasa* preparations in which metals and minerals are processed after various *Samskaras*(processing) like *Shodhana, Marana, Amrutikarana, lohitikarana* and so on.[2]

Bhasmikarana converts toxic compounds are converted into non- toxic and bio-acceptable form. Moreover, they can be easily acceptable, palatable, fast acting and effective in small dosages and have long shelf life without losing their potency. *Abhraka Bhasma* is an excellent cellular regenerator and nervine tonic. It is indicated in various chronic diseases such as Tuberculosis, COPD and many types of cardiac diseases.[3]

AIM AND OBJECTIVE

Standard preparation of *Abhraka Bhasma* and pharmaceutico-analytical evaluation of *Abhraka Bhasma*.

MATERIAL AND METHODS

Abhraka Bhasma was prepared in Patanjali Bhartiya Ayurvigyan Evam Anusandhan Sansthan, Haridwar, Uttarakhand. *Abhraka Bhasma* was prepared by following *Rasa Tarangini* 10/46.

Abhraka Shodhana[4]

Reference: *Rasa Tarangini 10/20*
Principle: *Nirvapa*.
Ashuddha Abhraka (480 g) was heated red-hot on a charcoal grill and immediately quenched in fresh *Triphala Kwatha*, repeated 7 times. (see figure 1)
● Each *Nirvapa* softened the *Abhraka*, separated its layers, darkened its colour, and increased lustre; hissing and fuming were observed.
● Weight increased progressively due to *Kwatha* absorbed between layers.
Result: *Shuddha Abhraka* weight increased from 480 g to 687 g.

Kanji Nirmana[5]

Reference *Bhaishajya Ratnavali* 4/52-53
Principle: *Sandhana* (Fermentation).
Cooked rice and *Muli* pieces were sealed in a *Guggulu*-fumigated jar with water and allowed to ferment for 43 days (28 + 15).
● Completion confirmed by positive match-stick test, sour taste and smell, pH 3, and reddish-yellow transparent liquid.
Result: 5800 ml *Kanji* obtained, used for *Shodhana* of *Dhanyabhraka*.

Dhanyabhraka Nirmana[6]

Reference: *Rasendra Sara Sangraha* 1/147-148
Principle: *Nimajjana*.
Shodhita Abhraka (687 g) mixed with *Shali Yava* was tied in a jute *Pottali* and immersed in Kanji for 72 hours, then rubbed to release fine particles which settled and were collected. (see figure 2)
● *Abhraka* became softer, finer, and vinegar-scented; *Kanji* turned grey-black.
Result: 580 g *Dhanyabhraka* obtained (loss: 107 g).

Abhraka Marana[7]

Reference: *Rasa Tarangini* 10/46
Principle: *Bhavana* followed by *Marana*.
Dhanyabhraka (580 g) was triturated with *Eranda Patra Swarasa* and *Gudd*, made into *Chakrikas*, and subjected to 26 *Gajaputas* (peak ~980°C), each with fresh *Swarasa* and *Gudd*. (see figure 3)
● Weight and lustre progressively decreased; colour changed from dark green → black → grey → brown → brick red.
● At the 21st *Puta*, *Nischandrikarana* was performed by adding *Kalmishora* and *Gudd*; *Bhasma* was then soaked in water for 20 days to lower pH from 12 to 7.
● *Nischandrata* achieved after the 21st *Puta*; *Varitara* reached 90% and *Rekhapurnata* 100% by the 25th–26th *Puta*.

OBSERVATIONS

Observation and result of all the 26 *Putas* with the measurement of peak temperature during each *Puta* and changes in colour after each *Puta* and *Bhasma Pariksha* are mentioned in table 1.

Table 1: Observation of *Abhraka Marana* in different *Puta*.

No. of *Puta*	Wt. after each *Puta* (gm)	Peak temp. During *Puta* (°C)	Colour	*Nish-chandrata (+/-)*	*Varitara (%)*	*Rekha-purnata (%)*
1.	565	880	Dark green	-ve	-ve	-ve
2.	561	890	Black	-ve	-ve	-ve
3.	558	894	Black	-ve	-ve	-ve
4.	552	910	Black	-ve	-ve	-ve
5.	545	914	Black	-ve	-ve	-ve\
6.	532	920	Black	-ve	-ve	-ve
7.	520	890	Black	-ve	-ve	-ve
8.	515	910	Grey	-ve	-ve	-ve
9.	502	940	Grey	-ve	-ve	-ve
10.	492	944	Grey	-ve	-ve	-ve
11.	480	960	Brown	-ve	-ve	-ve
12.	465	890	Pale brown	-ve	-ve	-ve
13.	458	970	Pale brown	-ve	20	20
14.	442	840	Dark brown	-ve	30	20
15.	430	870	Brown	-ve	30	20
16.	415	910	Brown	-ve	40	30
17.	390	910	Brown	-ve	40	40
18.	370	875	Pale brown	-ve	50	45
19.	362	880	Brown	-ve	60	50
20.	348	920	Pale brown	-ve	60	60
21.	332	960	Pale brown	+	60	70
22.	451	940	Pale brown	+	70	80
23.	318	920	Pale brown	+	70	90
24.	312	890	Brown	+	80	90
25.	306	890	Brick	+	85	100
26.	300	910	Brick	+	90	100

RESULT

Result of *Abhraka Bhasma Nirmana* is given in table 2:

Table 2: Result of *Abhraka Bhasma.*

Parameter	Value
Initial weight	580 gm
Final weight	300 g
Weight loss	280 g (47 %)
Bhasma Varna	*Ishtika Varna*
Odour / Touch	Odourless / Smooth

***Abhraka Amritikarana*[8]**

Reference: *Rasa Tarangini* 10/68-69

Principle: *Amritikarana*.

Abhraka Bhasma (300 g) was heated with *Triphala Kwatha* and *Goghrita* in an iron vessel until both were fully evaporated. (see figure 4)

● *Bhasma* turned deep black, with fine, smooth particles.

Result: Weight increased from 300 g to 375 g (25% gain).

***Abhraka Lohitikarana*[9]**

Reference: *Rasa Tarangini* 10/65-67

Principle: *Lohitikarana*.

Bhasma (375 g) was triturated with *Manjishtha Kwatha* and given 6 *Gajaputas*, each with fresh *Kwatha*, until *Ishtika Varna* (brick-red colour) was obtained. (see figure 5)

● *Nischandrata* was positive from the 1st *Puta; Varitara* and *Rekhapurnata* progressively rose to 100% by the final *Puta.*

RESULT

Result of *Abhraka Bhasma Lohitikaranam* is mentioned in table 3:

Table 3: Result of *Abhraka Bhasma Lohitikaranam.*

Parameter	Value
Initial weight	375 gm
Final weight	300 g
Weight loss	75g (20%)
Bhasma Varna	*Ishtika Varna*
Odour / Touch	Odourless / Smooth

Classical Parameters of *Bhasma Pariksha*

***Varitara Pariksha*[10]**

This test is applied to study the lightness and fineness of *Bhasma. Varitara* is the floating character of *Bhasma* on a stagnant water surface. *Varitara* test can be considered, based on the low surface tension. Here the particles of *Bhasma* attain so much fine and light character that cannot break surface tension of stagnant water.

Procedure

Water was taken in clean transparent glass. Now a little amount of *Bhasma* was taken in between index finger and thumb, sprinkle it slowly on stagnant water surface from a short distance. The properly incinerated *Bhasma* will float on the surface of water.

***Unnama Pariksha*[11]**

This test is applied to study the lightness of *Bhasma* and for further revalidation of *Varitara Pariksha.*

Procedure

This test is subsequently performed after *Varitara Pariksha*. *Bhasma* is slowly sprinkled on stagnant water and then grain is placed over the *Bhasma* if the grain floats over the *Bhasma* is considered to be accurate.

***Rekhapurnata Pariksha*[12]**

This test is applied to study the micro- fineness of *Bhasma.* The *Bhasma* particles should be of minimum size for the easy absorption and assimilation in the body. The large particles may cause irritation to the mucous membrane of gastrointestinal trace and cannot be absorbed properly.

Procedure

A little amount of *Bhasma* is rubbed in between the index finger and thumb. It is observed whether the particles can fill in the furrows of fingertips. If the *Bhasma* attains the micro fine character so as to fill in the furrows, it may be considered as genuine (properly incinerated).

***Nischandrata Pariksha*[13]**

The natural lustre of the metal should not be there after the incineration stage. Presence of lustre indicates the process is not completed.

Procedure

A little amount of *Bhasma* is rubbed in between two fingers and then observed in sunlight for presence of any lustre. The properly incinerated *Bhasma* does not have any kind of lustre.

Physico- Chemical parameters

- **Partcle size**[14]

Particle size analysis is used to characterize the size distribution of particles in a given sample. Particle size analysis can be applied to solid materials, suspensions,

emulsions and even aerosols. There are many different methods employed to measure particle size. Some particle sizing methods can be used for a wide range of samples, but some can only be used for specific applications. It is quite important to select the most suitable method for different samples as different methods can produce quite different results for the same material.

- **pH**[15]

The pH value of an aqueous liquid may be defined as the common logarithm of the reciprocal of the hydrogen ion concentration expressed in "g/L". Although this definition provides a useful practical means for the quantitative indication of the acidity or alkalinity of a solution, it is less satisfactory from a strictly theoretical point of view. No definition of pH as a measurable quantity can have a simple meaning, which is also fundamental and exact.

A digital or analogue pH meter, a glass electrode, and a reference electrode can all be used to potentiometrically determine the pH of a liquid.

- **Loss on drying**[16]

After precisely weighing the drug to within 0.01 g, transfer about 10 g into a tared evaporating dish, dry at 105° for 5 hours, and weigh. Continue the drying and weighing at one-hour intervals until the difference between two successive weighing corresponds to not more than 0.25 per cent. Constant weight is reached when two consecutive weighing after drying for 30 minutes and cooling for 30 minutes in minutes in a desiccator, show not more than 0.01g difference.

- **Total ash**[17]

In a silica or tared platinum dish, incinerate 2 to 3 g of the ground drug, precisely weighed, at a temperature not to exceed 450° until carbon is removed. Then, cool the mixture and weigh it. Should this method not yield a carbon-free ash, extinguish the burned mass using warm water, gather the leftover residue on ashless filter paper, burn the residue and paper together, incorporate the filtrate, evaporate until completely dry, and light the mixture at a temperature not to surpass 450°. With respect to the drug that has been air-dried, determine the percentage of ash.

- **Acid insoluble ash**[18]

To the crucible containing total ash, add 25 of dilute hydrochloric acid. Collect the insoluble matter on an ashless filter paper (Whatman 41) and wash with hot water until the filtrate is neutral. Transfer the filter paper containing the insoluble matter to the original crucible, dry on a hot-plate and ignite to constant weight. Allow the residue to cool in a suitable desiccator for 30 minutes and weigh without delay. Calculate the content of acid-insoluble ash with reference to the air-dried drug.

- **Water soluble extractives**[19]

Proceed as directed for the determination of alcohol-soluble extractive, using chloroform-water instead of ethanol.

Instrumental parameters

- **XRD**[20]

Instrument – Automated X-Ray Diffractometer
Make – Rigaku
Model – Mini flex

A potent non-destructive method for examining the structural characteristics of crystalline materials is X-ray diffraction, or XRD. When a collimated x-ray beam is directed towards a crystalline substance, a diffraction pattern is created. Information on crystal structures, phase purity, grain size, and other characteristics can be obtained from the diffraction pattern and the intensity each diffracted x-ray as a function of the diffraction angle.

The X-ray diffractometer scans were made on randomly oriented samples from 2-theta with a scan rate of 4° per minute for 20 minutes. The 2-theta value and intensity of the peak (counts) are represented on the X and Y- axis respectively. Please note that higher the value of counts represents higher the crystallinity of the phase. The crystalline varies from sample to sample and experimental conditions. For identification of each phase, peaks were chosen and compared with standard X-ray Powder Diffraction File (XPDF). The standard XPDF number, identified phase and composition are also given.

- **XRF**[21]

Instrument – X-ray fluorescence spectroscopy
Make – Rigaku
Model – ZSX Primus IV

The XRF spectroscopy is widely used for the qualitative and quantitative elemental analysis of environmental, geological, biological, industrial and other samples. XRF has the advantage of being non-destructive, multi-elemental, fast and cost-effective.

The X-ray fluorescence principle is depicted in the figure. An inner shell electron is excited by an incident photon in the X-ray region. During the de-excitation process, an electron is moving from a higher energy level to fill the vacancy. The energy difference between the two shells appears as an X-ray, emitted by the atom. The X-ray spectrum acquired during the above process reveals a number of characteristic peaks. The energy of the peaks leads to the identification of the elements present in the sample (qualitative analysis), while the peak intensity provides the relevant or absolute elemental concentration (semi-quantitative or quantitative analysis).

- **SEM**[22]

Instrument – Scanning Electron Microscopy
Make – ThermoFisher
Model - Apreo S Low Vac

It is a type of microscope, which creates an image of a sample surface using electrons as opposed to light. SEM pictures are helpful for determining the surface structure of the sample because of their distinctive three-dimensional look. SEM offers the following details:
Topography: -The surface feature of an object.
Morphology: - shape, size and arrangement of particles.
Details about the crystal's layout and degree of order on a single crystal particle larger than 20 micrometres are known as crystallographic information.

- **EDS**

A number of physical phenomena, in addition to the electron interactions used for imaging, take place at the sample surface. It is possible to take advantage of these interactions to obtain chemical information. As secondary electrons are generated for imaging, the interacted atom becomes ionized and must capture an outer shell electron to return to the ground state. According to law of conservation of energy, a photon is then emitted which is characteristic of the shell transition that occurred and is "quantized" as defined by the rules of quantum mechanics. We measure the energy of that emitted photon and essentially "look it up," for the energy transitions that occur for each element. The EDS detector is the tool we utilize for measuring the energy of the emitted photons in the X-ray electromagnetic spectrum.

Applications of the field emission scanning electron microscopy (FE-SEM)
1. Thickness measurements for thin coatings and films.
2. Surface appearance and morphology are correlated.
3. The height and lateral dimensions of nanometre-sized objects are measured.
4. Cell size and size distribution in foam materials have been characterized.
5. Elemental analysis of micron-scale features.

- **FTIR**[23]

Instrument – Fourier transform infrared spectrophotometry
Make – Perkin Elmer
Model – Spectrum Two

This is one of the most popular techniques for comparing compounds and locating functional groups in both pure and mixed forms. Organic compounds absorb electromagnetic energy in the infrared region of the spectrum.

Infrared radiation can speed up the vibration of individual atoms and groups of atoms within organic compounds by vibrating around their bonds, even if it lacks the energy to excite electrons. The infrared spectrum is represented by wave numbers, which are expressed in cm^{-1} and show the % transmittance as a function of frequency. The zone spanning from 600 to 1400 cm-1 is known as the fingerprint region because, akin to an individual's fingerprint, the absorption pattern within this range is unique to a particular molecule.

➢ **Gas Chromatography Mass Spectrometer**[24]

The GC-MS principle combined Gas Chromatography (GC) for sample separation and Mass Spectrometry (MS) for identification. First, the sample was vaporised and separated into individual components within a chromatographic column based on their affinity for the stationary phase. These separated components then entered the mass spectrometer, where they were ionised, fragmented, and separated according to their mass-to-charge ratio (m/z). The resulting mass spectrum acted as a unique fingerprint, allowing for the identification and quantification of the original compounds in a mixture.

RESULTS

2. organoleptic parameters Classical Parameters of *Bhasma Pariksha*

Evaluation of the organoleptic parameters indicates that *Abhraka Bhasma* complies with classical quantity standards. The fine texture, tasteless nature and absence of odour reflect proper processing of *Abhraka Bhasma.* Positive findings in *Rekhapurna* and *Varitara* shows good particle size, purity and lightness for therapeutic use.

Table 4.14: Results for Classical parameters of *Abhraka Bhasma*.

S.No.	Parameters	*Abhraka Bhasma*
1.	*Shabda* (sound)	No perceptible sound produced during chewing
2.	*Sparsha* (Touch)	Smooth, no coarse particle
3.	*Varna* (colour)	*Ishtika Varna*
4.	*Rasa* (Taste)	Tasteless
5.	*Gandha* (Odour)	Not specific
6.	*Nishchandrika*	Positive
7.	*Rekha purnatva*	Positive
8.	*Varitara*	Positive
9.	*Unama pariksha*	Positive

3. Physico- Chemical parameters

Physico-Chemical paramters of *Abhraka* bhasma is mentioned below in table 4.15.

Table 4.15: Results for Physico- Chemical parameters of *Abhraka Bhasma.*

S.No	Parameter	*Abhraka Bhasma*
1.	pH (by pH strip)	8.08
2.	Loss on drying at 105ºC	0.06% w/w
3.	Total ash	99.51% w/w
4.	Sulphated ash	61.58% w/w
5.	Acid insoluble ash	11.55% w/w
6.	Water soluble extractive value	0.27% w/w
7.	Alcohol soluble extractive value	.09% w/w

4. Instrumental parameters

- **XRD**

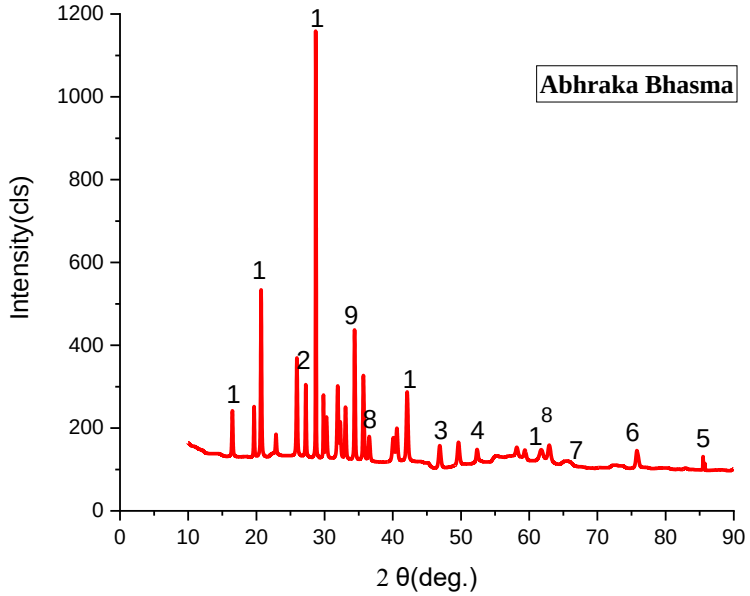


Figure 4.1 Graph of XRD of *Abhraka Bhasma.*

Table 4.16: Showing the values of 3 strongest peak of *Abhraka Bhasma.*

Formulation	2Theta Value	Compound Name	Compound Formula
Abhraka Bhasma	28.99 20.74 34.37	$KAlSiO_4$, $KAlSiO_4$, $KAlSiO_4$,	Kalsilite (Potassium aliminium silicate) Kalsilite (Potassium aliminium silicate) Kalsilite (Potassium aliminium silicate)

- **XRF**

Values of elements and oxides present in *Abhraka* Bhasma are mentioned in table 4.17 and table 4.18

Table 4.17: Value of element in *Abhraka Bhasma.*

Component	Unit	*Abhraka Bhasma*
K	Mass %	31.1079
Si	Mass %	26.7099
Al	Mass %	16.4793
Ca	Mass %	12.2938
Fe	Mass %	6.8566
Mg	Mass %	2.6161
P	Mass %	2.5762
Cl	Mass %	0.4735
Na	Mass %	0.2396

Table 4.18: Value of oxide in *Abhraka Bhasma*.

Component	Unit	*Abhraka Bhasma*
SiO_2	Mass %	37.1831
Al_2O_3	Mass %	22.3776
K_2O	Mass %	20.0965
CaO	Mass %	7.8756
Fe_2O_3	Mass %	4.2023
MgO	Mass %	3.4996
P_2O_5	Mass %	3.4014
Na_2O	Mass %	0.2200
Cl	Mass %	0.2660

DISCUSSION

- **XRF** elemental scanning of *Abhraka Bhasma* shows K 31.1079 Mass% and Si 26.7099 Mass% are seen in maximum quantity and P, Cl and Na in descending quantity. In oxide scanning SiO_2 37.1831 Mass% and Al_2O_3 22.3776 Mass % was found in highest amount and P_2O_5, Na_2O and Cl in descending quantity.

➢ **SEM**

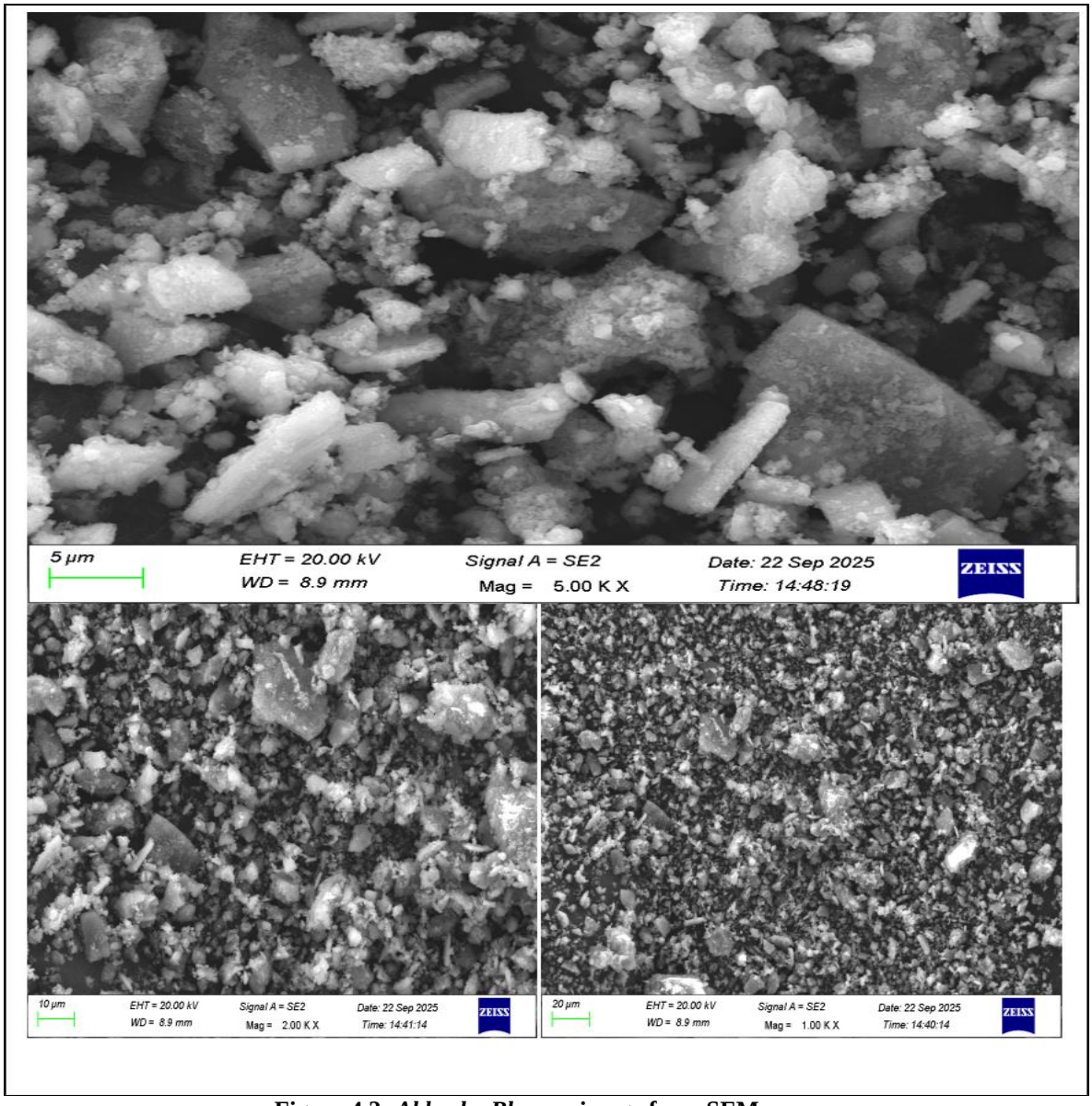


Figure 4.2: *Abhraka Bhasma* image from SEM scan.

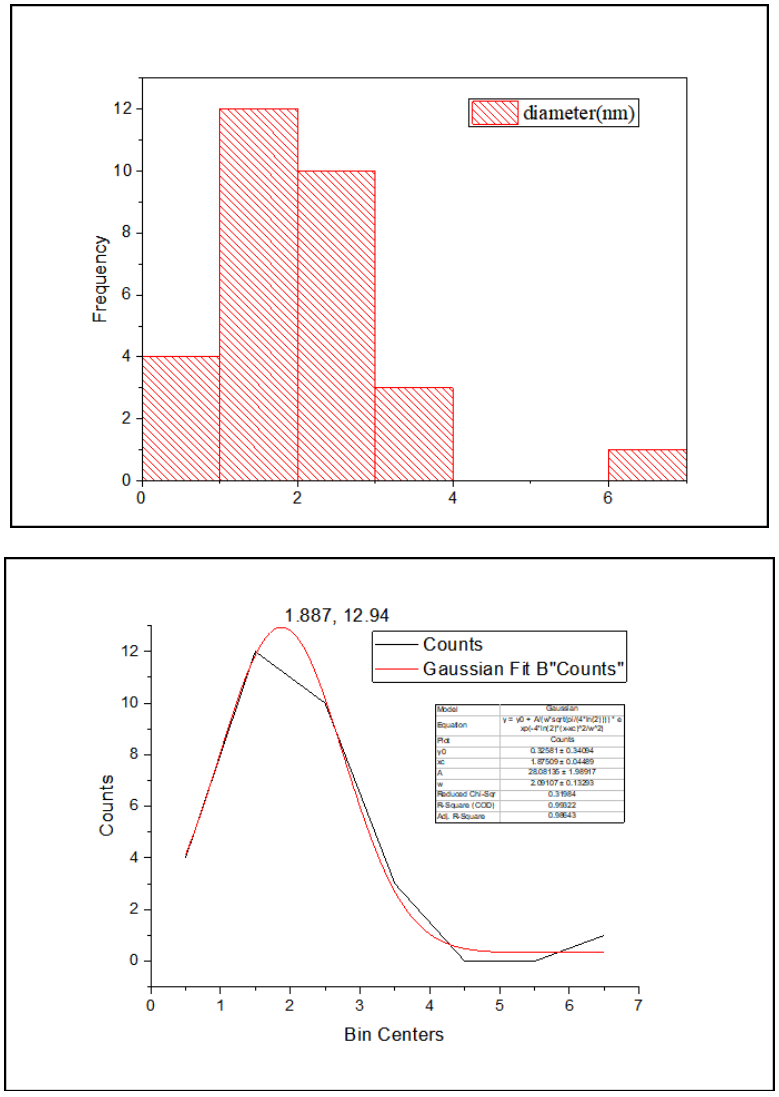
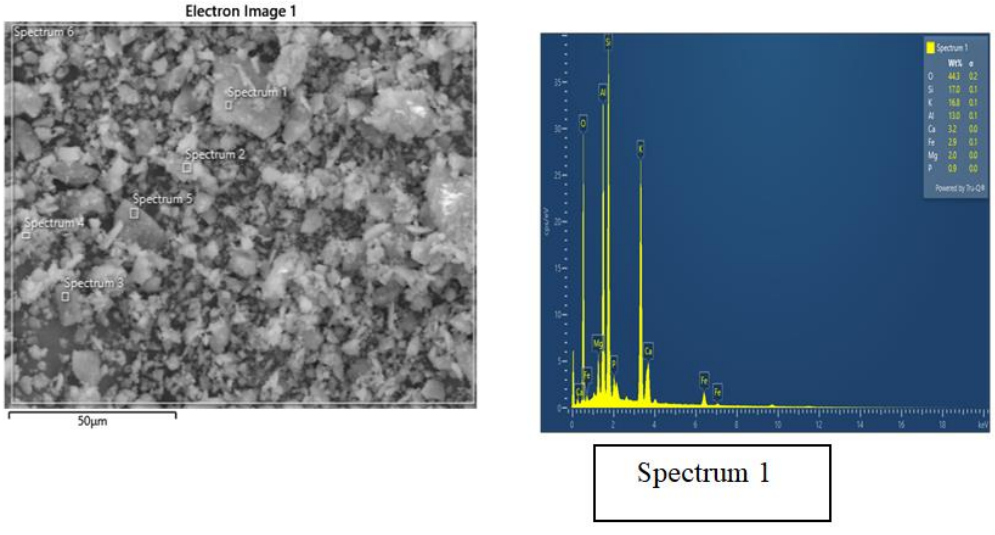


Figure 4.3: Graph of particle size of *Abhraka Bhasma* from SEM scan.

Discussion: SEM data was analyzed using Image J software. Average diameter was calculated by plotting its histogram and Gaussian distribution fuction. The data was plotted in origin software. Average diameter or particle size of *Abhraka Bhasma* is 1.88 nm.

- **SEM- EDS**



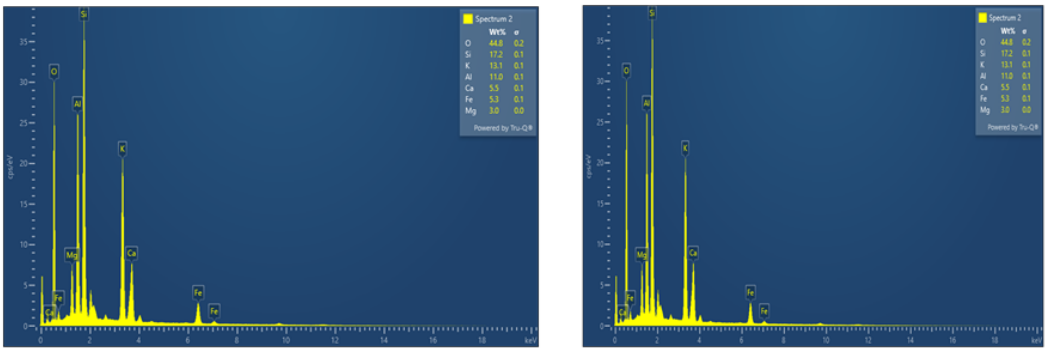


Figure 4.6: Interpretation of SEM-EDS spectrum of *Abhraka Bhasma.*

Table 4.19: SEM-EDS presentation of *Abhraka Bhasma.*

Abhraka Bhasma	Silicon (Si)		Aluminium (Al)		Oxygen (O_2)		Potassium (K)	
	Weight (%)	Atomic (%)	Weight (%)	Atomic (%)	Weight (%)	Atomic (%)	Weight (%)	Atomic (%)
Spectrum 1	16.97	13.34	13.02	10.66	44.35	61.22	16.77	9.47
Spectrum2	17.22	13.59	10.99	9.02	44.81	62.04	13.10	7.42
Spectrum 3	20. 62	17.45	14.87	13.10	34.48	51.23	21.12	12.84

- **FTIR**

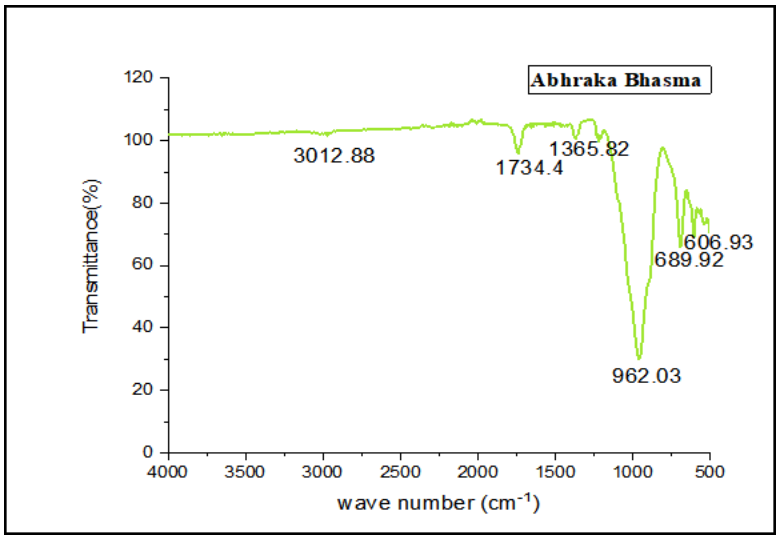


Figure 4.8: Interpretation of FTIR spectrum of *Abhraka Bhasma.*

Table 4.21: FTIR interpretation of *Abhraka Bhasma.*

Observed Peaks	Functional Group	Predicted Phytochemicals	Peak Depth
3012.88	C-H Stretching	Alkene	Medium
1734.4	C=O Stretching	α,β- unsaturated este	Strong
1365.82	C-H Bending	Alkane	Medium
962.03	C-O Stretching	Vinyl Ether	Strong
689.92	C=C Bending	Alkene	Medium to weak
606.93	C=C Bending	Alkene	Weak

Discussion: *Abharaka Bhasma* FTIR spectra were displayed in figure and table above, the main IR absorption peaks were observed at 3012.88 (C-H Stretching), 1734.4 (C=O Stretching), 1365.82 (C-H Bending), 962.03 (C-O stretching), 689.92 (C=C Bending), 606.93 (C=C Bending).

DISCUSSION

Abhraka Bhasma is indicated in *Kapharoga, Agnimandya, Grahani, Pandu, Rasayana* etc. Previous reports indicated that *Abhraka* comprises anti-inflammatory properties. It is prescribed for *Agnimandya* (low digestive fire), *Grahani* (malabsorption), and *Arsha* (piles). Its role in strengthening the Agni (digestive power) is repeatedly emphasized Chemical finger printing of *Abhraka Bhasma* identified the presence of various silica rich, aluminum, iron and magnesium containing compounds. *Abhraka Bhasma* exerts immune-mod.

- *Abhraka Shodhana*

Shodhana by Nirvapa in Triphala Kwatha removes physical and chemical impurities from raw *Abhraka*, detoxifying it and enhancing therapeutic suitability for Bhasma preparation. Weight increased from 480 g to 687 g (30% gain), attributable to decoction absorbed by the exfoliating mica layers.

- Dhany*Abhraka* Nirmana

Shali Dhanya and acidic Kanji were used to make mica more brittle and purified. Friction between grain and mica in the Kanji medium progressively fragments the mineral, reducing particle size before Marana and lowering toxicity. From 687 g *Abhraka*, 172 g Yava and 5800 mL Kanji, 580 g Dhany*Abhraka* was obtained (loss: 107 g, 15.57%).

- *Abhraka* Marana

Through 26 *Putas* with *Eranda Patra Swarasa and Gudda*, *Abhraka* was transformed into a fine, smooth, brick-red Bhasma showing all Siddhi Lakshanas. Progressive weight loss, loss of lustre, and colour change reflect the precision of *Rasashastra* technique. *Vata Patra*, being thick and fibrous, burns at ~380°C and provides optimal heat exposure within the Samputa. Chakrika hardness, *Abhraka* weight, *Swarasa* quantity, and Chandrika all decreased with each Puta. Temperature was monitored every 10 minutes, reaching a maximum of ~950°C in Gaja Puta, with Bhasma Pariksha performed after each Puta.

Since Chandrika persisted even at the 20th Puta (the minimum generally needed for therapeutic potency), *Nischandrikarana* was performed per Ayurveda Sara Samgraha using *Kalmishora*, an alkaline *Kshariya* Dravya capable of removing metallic lustre. Bhasma pH, initially 12, was brought to 7 by repeated washing. Overall weight fell from 580 g to 300 g (loss: 280 g, 48.28%), due to combustion of organic matter, moisture loss under repeated high heat, and minor mechanical/handling losses.

- *Abhraka Amritikarana*

Per Rasa Tarangini, Amritikarana is essential even after proper Marana to reduce *Rukshata, Teekshnata, and Ksharata*, rendering the Bhasma safe and Rasayana in nature. Heating with Triphala Kwatha and *Goghrita* until evaporation increased Bhasma weight by 25% (300 g to 375 g). Iron oxide, the chief constituent responsible for the brick-red colour, converts to a mixed ferrous-ferric oxide on heating, turning the Bhasma black — necessitating subsequent Lohitikarana to restore its natural colour.

- *Abhraka Lohitikarana*

The blackened Bhasma was triturated with *Manjishtha Kwatha*, rich in red anthraquinone pigments (alizarin, purpurin, manjistin), and given 6 *Gajaputas*. No colour change occurred until the 2nd Puta; a gradual shift began thereafter, reaching complete brick-red (Ishtika Varna) by the 6th Puta, with Varitara improving after each firing. Weight decreased from 375 g back to 300 g, as the mass gained during Amritikarana was shed again through repeated firing, yielding a lighter, purely mineral, red Bhasma. ulatory properties by stimulating phagocytic activity in leucocytes.

Analytical study of *Abhraka Bhasma*

Abhraka Bhasma is red in colour, fine in touch and tasteless. It contains K 31.1% w/w in maximum amount, pH 6, LOD 0.18 % w/w, Total Ash 99.14 % w/w, Acid insoluble Ash 2.31 % w/w and Water-soluble extractives 1.81 % w/w.

XRD shows highest intensity peaks at these 28.99, 20.74, 34.37 2- theta value which represents $KAlSiO_4$ Kalsilite (Potassium aluminium silicate).

XRF- elemental scanning shows K 31.1079 Mass% and Si 26.7099 Mass% are seen in maximum quantity and P, Cl and Na in descending quantity. In oxide scanning SiO_2 37.2 Mass% and Al_2O_3 22.3 Mass % was found in highest amount and P_2O_5, Na_2O and Cl in descending quantity.

SEM- SEM data was analysed using ImageJ software, average diameter was calculated by plotting its histogram and gaussian distribution function. The data was plotted in origin software. Average diameter of *Abhraka Bhasma* particle is 1.88 nm. This shows *Abhraka Bhasma* can be considered as nanomedicine. Smaller particle size has greater chances of faster absorption.

EDS- The EDS analysis confirmed the presence of major elements such as Silicon (Si), Aluminium (Al), Potassium (K) and Oxygen (O_2). Minor traces of Magnesium (Mg) and Calcium (Ca) were also detected. The elemental composition supports the silicate and oxide nature of *Abhraka Bhasma*.

FTIR- *Abharaka Bhasma* FTIR spectra, the main IR absorption peaks were observed at 3012.88 (C-H Stretching), 1734.4 (C=O Stretching), 1365.82 (C-H Bending), 962.03 (C-O stretching), 689.92 (C=C Bending), 606.93 (C=C Bending).

CONCLUSION

In conclusion *Abhraka Bhasma*, analysed satisfies the criteria mentioned in the Ayurvedic Pharmacopoeia. The results obtained show that the sample does not contain any toxic metal even in the trace levels and is of standard quality. The data of the present study suggests that the characterized *Abhraka Bhasma* sample, constituting nanoparticles, is in the tune with nanotechnology of contemporary era.

Figure 1: *Abhraka Shodhana.*

Fine particles of *Abhraka* | *Dhanya* | Settled *Abhraka* | *Dhanyabhraka*

Figure 2: ***Dhanyabhraka Nirmana.***

Eranda Patra Swarasa* +1/8th part *gudd

Bhavana | ***Chakrikas*** | ***Samaputikarana*** | ***Gaja Puta***

Temperature | ***1st Puta*** | ***10th Puta*** | ***26th Puta***

Figure 3: ***Abhraka Marana.***

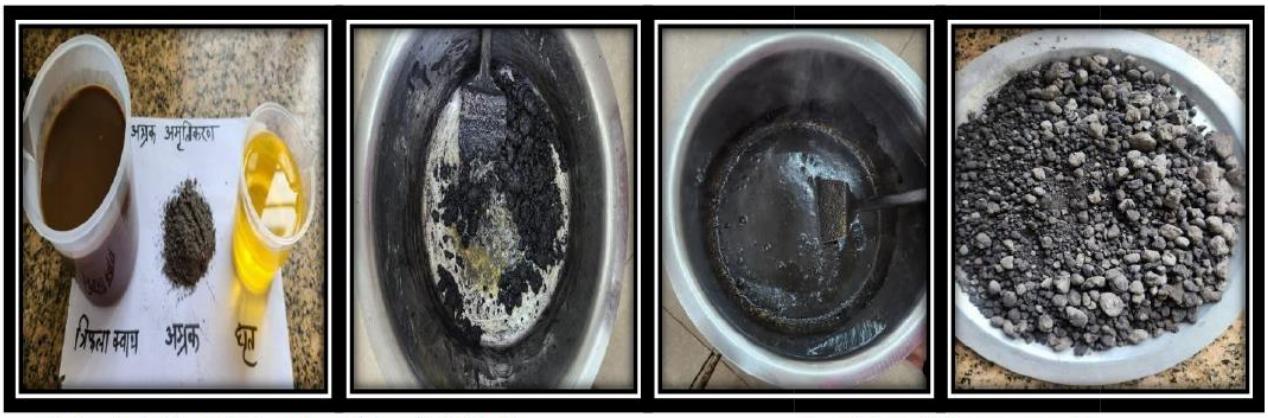


Figure 4: ***Abhraka Amritikarana.***

Figure 5: ***Abhraka Lohitikarana.***

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