Ayurline I J – R I M

AYURLINE

e-ISSN: 2456-4435
July- Sept. 2022
Vol. 06th Issue:3rd

International Journal of Research in Indian Medicine

A Review on Analytical study of *ABHRAKA BHASMA*

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ABSTRACT:-

In Ayurveda, *Bhasma* is a herbometallic preparation obtained as ash in which various metals/or their ores were repeatedly incinerated with decoctions of various herbs.With the help of analytical study, presence of elements, compounds, organic and inoganic matter in the formulations can be confirmed. Analysis of *Abhraka bhasma* makes to find more easier to understand phyiscochemical changes occured after repeated incinerations in the compound.Different steps present in the preparation of *bhasma* with the help of analytical study, its formation and breaking of chemical bond, compound, elements are clearly visualised.

Keywords: *Shatputi Abhrak Bhasma, Maharasa*

INTRODUCTION:

Ayurveda is the traditional science of life that provides an approach to look at a person's physical and mental health. As Ayurveda can treat many chronic diseases with the aid of herbs and herbomineral drugs that are prepared authentically, But because of its shortage of scientific validation in various concepts, it requires an appropriate study. Rasashastra is a specialized branch of Ayurveda that focuses on metals, minerals and other substances, including mercury are purified and paired with herbs in an attempt to cure the disease. *Abhraka*, a herbo-mineral classified as *Maharasa* that is commonly known as mica. It is obtained from minerals, it can impair efficacy due to the presence of impurities. To make it easily assimilate in the body without causing adverse effects, it has to go through processes like *Shodhan*, *Marana* etc. A lot of research has being done on *Abhraka* that has been published in various sites, journals, etc. Due to many published papers, it has become an important part to conclude on the basis of its scientific studies carried out so far and indicates on its Properties and Its Standardisation.

AIMS AND OBJECTIVE:

The present review focuses on analytical study published in papers, journals, sites etc. which brings together all details about *Abhraka* and create more provable assumptions.

MATERIALS:

As there are many published papers found on *Abhraka* and *Abhraka bhasma* with its standardisation were searched.

METHODS:

Analytical findings of *Abhraka bhasma* observed during survey on Research articles and papers are as follows :-

1. Sahasraputi *Abhraka bhasma* (100putas) analytical test was done.[1]

i. In EDXRF, presence of elements was in oxidised form are S (13%), K (8%), Ca (11%) and Fe (22%). No carbon compound observed.

ii. In FEG-SEM (Field Emission Gun, Scanning Electron Microscopy), particle size noticed was unevenly arranged (heterogeneous) present between 29nm and 88nm. Irregular shape ranging from spherical to oblongated.

iii. In EDS, higher percentage elements was detected such as O (41%), Si (16%), K (13%) and Fe (13%)

While in lower percentage elements were Al (6%), Mg (5%), Ca (4%) and Cl (1%) and in Traced elements (<1%) were Na, P, Ti.

2. Analytical test was done after 20th puta of *Abhraka bhasma* when *DhanyAbhraka* subjected with *Eranda patra swarasa and Guda*.[2]

i. In XRD study compound contains Iron in Ferric oxide form such as $FeSO_4$, Fe_2O_3. Comparatively presence of Iron observed in *Ashuddha Abhraka* 19.55%, *Shuddha Abhraka* 17.31%, *Abhraka Bhasma* 21.16%

ii. In SEM study, irregular shape of particle size whereas small particle sediments on larger particle observed.

3. Sahasraputi *Abhraka bhasma* was procured from Dhootpapeshwar Ltd.[3]

i.In Spectrophotometric analysis of *Abhraka bhasma*, Iron salt exhibited an absorption peak in the range of absorptionand No peaks for acidic solution.

ii. In IR study of *Abhraka bhasma*, low moisture and organiccontent in the powder & presence of high amounts ofmetals was observed.

4. Analytical study of *Abhraka bhasma* of 2 different methods i.e.after 35 puta and after 37 puta.[4]

i. In XRD, major diffraction peaks were observed in 35th and 37th puta indicates that crystalline peak was decreasing as the process was followed with *Shodhan*, *DhanyAbhraka Nirmana* and *Marana*.

ii. In Fourier Transform Infrared (FTIR),various bonds of different functional groups observed indicateorgano-metallic nature of sample shows O-H bond was prominent from *Shodhana* to Amrutikarana stages. In method 1 strongest sharp bond of O=C=O stretching bond was observed increasing from *Shodhana* to *Marana* whereas in method 2 decreasing from *Shodhana* to

Marana. Si-O group sharp bond observed in both methods indicates removal of Sulphur and Silicon.

iii. In Raman spectroscopy,strongest peaks observed indicates presence of metallic oxides such as Fe-O, Mg- O and K-O and Se-Se bond whereas sharp peaks seenin the region of 480-800 cm^{-1} indicates halo compounds like C-I, C-Cl and C-Br

iv. In Scanning Electron Microscopy (SEM) study,particle size was reduced and crystalline increase in Shuddha *Abhraka*& in *DhanyAbhraka* fibrous strands increases. In *Marana*, fibrous structure disappeared & agglomerated clumps of finite particles seen whereas in Amrutikarana, particle shape changes and increased in size, edges were smooth. In method 1 square type particles while in method 2 spherical and rod like particles observed in Scanning Electron Microscopy (SEM) study.

v. In Transmission Electron Microscopy (TEM) study, different size and shape of particles observed and Final product was in agglomerated structure.

vi. After *Shodhan* Si, Al increases while Fe, Mg and C decreases whereas after *Marana* Fe, Mg increases, Si, C decreases and after Amrutikarana Si, Fe, C increases, Al, Mg decreases observed in EDX study.

vii. In BET (Brauner Emmet Teller) study, method 2 had High surface area of *bhasma*. Highest surface area indicates higher porosity.

viii. In Dynamic Light Scattering (DLS) study, bimodal distribution of particles observed in nanorange (50-500 nm) Method 1 (50%) & Method 2 (90%) seen.

ix. In TGA (Thermogravimetric analysis) study, presence of weight loss observed which indicates presence of moisture and decomposition of organic moieties.

5. Analytical studyof *Abhraka bhasma* was done at 3rd puta and after 30th puta.[5] *Abhraka bhasma* after 3 putas contains elements of Carbon, Oxygen, Magnesium, Aluminium, Silica, Sulphur, Potassium and Calcium whereas after 30 putas contains elements of Oxygen, Magnesium, Aluminium, Silica, Chlorine, Potassium and Iron in SEM-EDX analysis.

6. In SEM-EDAX study, particle size was reduced after *shodhan* process whereas maximum reduction in particle size observed in shodhit *Abhraka* with Badari kwath when Raw *Abhraka* was subjected with *shodhan* process with different liquid media i.e. Triphala kwath, godugdha, gomutra, badari kwath.[6]

7. Analytical study of *Abhraka bhasma* after 23rd puta when *DhanyAbhraka* was subjected with Eranda patra swarasa and Guda.[7]

i. In XRD study,presence of Fe_2O_3 , Al_2O_3, SiO_2, MgO, Na_2O_2 and K_2O.

ii. In SEM study,elements present in *Abhraka bhasma* were as O(49.78%), Si(19.94%), Al(11.74%), K(10.02%), Fe(4.81%), Ca(1.80%), Mg(1.18%), Na(0.72%).

iii. In FTIR study,presence of Organic compounds with functional group of Amines, Carboxylic acid, Esters , Nitroalcohol, Iodide and Bromide.

8. No structural change in the complex mixture of compound as compare to chemical formula such as
K (Mg, Fe+2) 3 (Al, Fe+3) Si3O10(OH, F) when raw *Abhraka* was subjected with different liquid media i.e. *Triphala Kwath, Godugdha, Gomutra, Kanji And Badari Kwath* and strongest peak of *Badari kwath* observed in XRD study.[8]

9. *Shatputi Abhraka bhasma* prepared and analytical study was done of final compound.[9]

i. In XRD analysis, number of puta increases new structure and molecules observed. In Shataputi *Abhraka bhasma* (i.e After Amrutikarana)exhibits Diopside, Sylvine, Magnetite, Forsterite & Cristobalite.
ii. In ICP-AES study, 20puta *Abhraka bhasma* shows presence of elements such as Cu, Mo, and S while
iii. In Amrutikarana percentage of elements observed increases of Fe, Al, K and Mg.
iv. In FEG-SEM study, no. of puta increases particle size decreases was detected.
v. In TEM study, morphology of *Abhraka bhasma* was in Polygonal shape observed.
vi. In TGA study,when *bhasma* heated at different temperatures and increases temperature gradually indicates melting, decomposition, and recrystallization and observed newer molecules formed with different molecular weights.
vii. In Ultraviolet-visible-infrared Spectroscopy, in order of reflectance observed that 20 puta of *Abhraka bhasma* passes most part of spectrum in the sunlight reflected comparable to 50 & 100 puta observed.

10. Standardisation of *Abhraka bhasma* was done after 1st puta, 5th puta, 10th puta and 20th puta.[10]

i. In Qualitative analysis, Fe, Al, Mg & K elements present after 20 puta of *Abhraka bhasma* whereas in
ii. Quantitative analysis percentage of elements was increasing gradually due to procedure of *Shodhana*,*Marana* after 1st puta, 5th puta, 10th puta and 20th puta.
iii. In XRD study, *Abhraka bhasma* shows a compound Fe3Al whereas 100th puta *Abhraka bhasma* shows a multi phasic compound such as Fe3A1, A13Fe, Mg2Si, MgO, FeO etc..
iv. In Metallographic study, Microstructures present in *Abhraka bhasma* were in oxidised state of elements such as Fe, Mg, Al and other elements and some were semifused masses.

11. Krishna Vajra *Abhraka*: Synthesis & Characterisation[11]

i. In SEM study, square shaped particles of mean size of 92.3mm.
ii. In EDAX study shows presence of Si, Mg, O, Fe, Ca, Na, C, K & Al.
iii. In XRD study, *Abhraka bhasma* revealed the crystalline nature of *bhasma* with mixture of various individual oxides.
iv. In DLS study, particles are unimodal in nature.
v. In FTIR & NMR, organic functional group indicating bio-inorganic nature of the *bhasma* targeted towards particular activity.

RESULTS AND DISCUSSION: -

Preparation of *Abhraka bhasma* includes Hundred to thousands number of incineration through various therapeutic purposes. The changes occurred in physico-chemical processare highlighted through its analytical study significance. XRF study reveals that *Abhraka* consists of Fe as a major element as compared to other elements especially when it is in a Raw form it consists of more amount of silica but after going through the process of *Shodhana*,*DhanyAbhraka* nirmanaand *Marana* the amount of silica get decreases. FEG-SEM study shows particle size of *Abhraka*are unevenly arranged from spherical to oblongated shape.In EDS major element present are O, Fe, K and Si.. XRD shows a major amount of Fe in the form of associated compound and in the monoclinic structure of $KMg_3(Si_3Al)\ O_{10}(OH)$. FTIR study shows organic compound with different functional group of O-H band, O=C=O stretching band, Si-O group sharp band, C-Br band while in Raman study shows a strongest peak of Fe-O, Mg-O, K-O. TEM study shows particles size of different size and shapes ranges from 50nm-1mm. BET study shows that higher surface area with higher porosity and in DLS study shows a Bimodal and Unimodal distribution of particles. TGA study shows that there is a weight loss due to moisture and decomposition of organic moieties. ICP-AES study shows that *Abhraka* have a highest range of Fe, Al and Mg. UV spectroscopy study shows that spectrum of sunlight get reflected at a distinct peak of 330nm and at 100puta reflected light is low. Metallographic study shows compound formation is in oxidised state of Fe, Mg, Al and other elements.

CONCLUSION:-

Elements present in the oxidised form in *bhasma* because presence of sulphide ores adhered in*Abhraka* convert into oxides by heating in a regular supply of air at a temperature below melting point of metal. *Abhraka* puta is given when heated at temperature approx 800-1000^{o}C. This process has been termed as Roasting as it converts sulphide ores into oxide[12] form hence it releases a large amount of metallic as well as toxic and acidic compounds in the form of volatile gases[13]. *Abhraka bhasma* particle size were observed as spherical to oblongated shape suggests that in powder rise of particle size changes from cohesive state to more free flowing[14]. Oblongated particles help to measure dimension but it has tendency to fracture along its weak narrow dimension and also hampers compaction as compare to spherical particles. Hence, Particle shape affects the resistance to shear of a granular materials[15] as its affect on porosity, friability, sedimentation rate. Increased in temperature of particles move faster as they gain kinetic energy results in

increased collision rate and diffusion rate[16]. In XRD, intensity of the X-ray diffraction line depends on the elemental composition of the sample and its preparation condition. Crystalline material as *Abhraka* observed as sharp diffraction peak[17]. As FTIR analyse the functional group detecting the absorption of light by a compound in the region of electromagnetic spectrum but only a polar molecular band get interacted with spectrum. Functional group is identified and becomes easier to know its physical, chemical properties of compound[18]. *Abhraka* contains a Organic compounds with functional group of Amines, Carboxylic acid, Esters, Nitroalcohol, Iodide and Bromide whereas in RAMAN spectroscopy, metallic oxides are also observedwhen in an amorphous state, the Raman bands are quite broad[19].Presence of functional group makes easier to determine the intrinsic reactivity of the parent molecule and in part responsible for the overall properties of the molecule[25]. In SEM, observation was at large area and details are given about its surface whereas In TEM internal details of particles size observed[20]. In BET analysis, porosity of particles observed which signifies strength, permeability and whether porous molecules are soluble in organic solvents[21]. In DLS, particle size distribution and colloidal stability of magnetic nanoparticles studied in *bhasma* based on theory of Brownian motion i.e. smaller particles move faster while larger moves slower in a liquid.[22] Through TGA, thermal stability of *Abhraka bhasma* and volatilite components monitoredwith the help of change in weight and it determines about its purity, drying, incineration of *bhasma*[23]. Presence of microstructures in *Abhraka bhasma* had a strongly control on its physical properties of elements such as strength, toughness, ductility, corrosion resistance decreases, temperature, etc[24].

With this study it can be conclude that when *shodhan* drugs are differs percentage of elements get differs and when the puta in number increases some elements get eliminated whereas some elements found in traces and its particle size also gets differ. Hence it has been concluded that the elements present commonly in *Abhraka bhasma* in any form Raw to its final product are in oxide form of Fe, Al, Mg onlyvariation is seen in its percentage.

REFERENCES: -

1. https://www.researchgate.net/publication/285738430_Analytical_evaluation_of_an_ayurvedi c_formulation_-_*Abhraka_Bhasma*

2. https://ijapr.in/index.php/ijapr/article/view/495
3. https://www.researchgate.net/publication/318921102_Study_of_General_Properties_of_Abhrak_*Bhasma*_A_Nanomedicine
4. https://www.sciencedirect.com/science/article/pii/S0975947618306971 https://reader.elsevier.com/reader/sd/pii/S0975947618306971?token=9E2A1BDA88BA8A039603E2DB9AAF1C6D3E0033334E0FAB46D3420D0EC9FD106440EAB9373B641CBB937D42CF2C49A12F&originRegion=eu-west-1&originCreation=20210606164644
5. https://ijapr.in/index.php/ijapr/article/view/1107
6. https://www.researchgate.net/profile/R-S-Singh/publication/255687941_IMPORTANCE_OF_MEDIA_IN_THE_PHARMACEUTICAL_PROCESSING%27S_OF_METALS_AND_MINERALS_SCANNING_ELECTRON_MICROSCOPY_STUDY_AND_ENERGY_DISPERSIVE_XRAY_ANALYSIS_OF_*ABHRAKA*_BIOTITE/links/0c9605203272d9a145000000/IMPORTANCE-OF-MEDIA-IN-THE-PHARMACEUTICAL-PROCESSINGS-OF-METALS-AND-MINERALS-SCANNING-ELECTRON-MICROSCOPY-STUDY-AND-ENERGY-DISPERSIVE-XRAY-ANALYSIS-OF-*ABHRAKA*-BIOTITE.pdf
7. https://www.irjponline.com/admin/php/uploads/2598_pdf.pdf
8. http://www.iamj.in/posts/images/upload/2391_2396.pdf
9. https://www.jdrasccras.com/doi/JDRAS/pdf/10.5005/jdras-10059-0086
10. http://nagarjunaayurveda.org/standardization-of-*Abhraka-bhasma*-w-r-t-chemical-pharmaceutical-and-metallographic-studies-t-maheswar-g-venkateshwarlu/
11. https://www.sciencedirect.com/science/article/pii/S0975947620300875
12. https://en.wikipedia.org/wiki/Roasting_(metallurgy)#:~:text=Roasting%20is%20a%20process%20of,the%20processing%20of%20certain%20ores.&text=This%20process%20is%20generally%20applied,as%20sulfur%20dioxide%2C%20a%20gas.
13. https://www.geeksforgeeks.org/conversion-of-ore-into-metal/
14. https://www.jstage.jst.go.jp/article/kona/32/0/32_2015002/_html/-char/en
15. https://www.sciencedirect.com/science/article/abs/pii/S089268751830548X
16. *Movement of particles* https://www.education.vic.gov.au/school/teachers/teachingresources/discipline/science/continuum/Pages/particles.aspx
17. https://www.researchgate.net/post/What_is_the_difference_between_XRD_pattern_of_amorphous_and_crystalline_material#:~:text=Crystalline%20phase%20exhibit%20sharp%20distinct,be%20easily%20identified%20using%20Xray.
18. https://byjus.com/chemistry/infrared-spectroscopy/
19. https://www.spectroscopyonline.com/view/raman-spectra-metal-oxides
20. *https://www.thermofisher.com/blog/microscopy/tem-vs-sem-whats-the-difference/*
21. https://en.wikipedia.org/wiki/BET_theory#:~:text=Brunauer%E2%80%93Emmett%E2%80%93Teller%20(BET,as%20physical%20adsorption%20or%20physisorption.
22. https://books.google.co.in/books?id=RV35DwAAQBAJ&pg=PA27&lpg=PA27&dq=based+on+brownian+moti

on+motion+states+that+smalle+rparticles+move+faster+in+dls&source=bl&ots=nFgIZ9koWo&sig=ACfU3U2aGQ8p46wusQFcMcPoXesKwbvykA&hl=en&sa=X&ved=2ahUKEwjnxeyTnNT1AhVUSGwGHYWNBfEQ6AF6BAgUEAM#v=onepage&q=based%20on%20brownian%20motion%20motion%20states%20that%20smalle%20rparticles%20move%20faster%20in%20dls&f=false

23. https://en.wikipedia.org/wiki/Thermogravimetric_analysis
24. https://en.wikipedia.org/wiki/Microstructure#:~:text=The%20microstructure%20of%20a%20material,temperature%20behaviour%20or%20wear%20resistance.
25. *https://pubmed.ncbi.nlm.nih.gov/32663408/*

Conflict of Interest: Non

Source of funding: Nil

Cite this article:

A Review on Analytical study of ABHRAKA BHASMA
Sheth Suchita Manish, Baranwal Ankita Anand

Ayurline: International Journal of Research In Indian Medicine 2022; 6(3):01-08