Research Article **CODEN: AJPAD7** **ISSN: 2321 - 0923**

Asian Journal of Pharmaceutical Analysis and Medicinal Chemistry

Journal home page: www.ajpamc.com

https://doi.org/10.36673/AJPAMC.2023.v11.i01.A02

PARTICLE SIZE ANALYSIS OF *BHASMA* – AN AYURVEDIC DOSAGE FORM

Shriram S. Savrikar*[1], Unmeshi Sabnis[1], Mukund Sabnis[1]

[1*]Jeevanrekha Analytical Services, Deolai, Aurangabad, Maharashtra, India.

ABSTRACT

Bhasma is an Ayurvedic drug form, usually produced from minerals and metals. Currently, many researchers are claiming *Bhasma* to be an ancient nanomedicine. Aim of this study was to carry out particle size analysis of some samples of *Bhasmas* to examine this claim. Particle size analysis of four samples of *Tamra Bahsma*, one sample each of *Svarnamakshika Bhasma*, *Swaymagniloha* and *Rasasindoora*; all collected from researchers; was conducted using image analysis with the help of Biovis PSA 2000 Particle size analyser. D10, D50 and D90 values of particle size distribution of the samples were assessed along with their morphological characteristics. Particle distribution in classes of 0 to 2.5, 2.5 to 5 and 5 to 10 micron ranges were also recorded. The study revealed that although almost 100% particles fall in the class of 0 to 2.5 microns, only 10% particles are observed to be <130nm in size. Therefore, *Bhasma* can't be labelled as a form of nano-medicine.

KEYWORDS

Bhasma, Rasasindoora, Svarnamakshika Bhasma, Nano-particles, *Tamra Bhasma* and Image analysis.

Author for Correspondence:

Shriram S. Savrikar,

Jeevanrekha Analytical Services,

Deolai, Aurangabad, Maharashtra, India.

Email: sssavrikar@gmail.com

INTRODUCTION

Minerals and metals are being used in therapeutics since ancient times. In the Vedic period their use was limited to carry them externally on the body. "In vedic period, mostly single herbs were used as medicines. Minerals and animal substances were also prescribed but no compound preparations were in use"[1]. Their internal use in therapeutic management was observed started during the period of Samhitas. Formulations like *Lohadi Rasayana* from Carak Samhita[2] and *Ayaskruti* from Susruta Samhita[3] represent the method of processing the metals for therapeutic use during the period of

Samhitas. The object of the methods of processing the metals and minerals in Samhita period appears to be to produce a micro-fine powder as fine as collyrium. The product so obtained was termed as *Sookshma Coorna*[2]. Therapeutic management during the Samhita period was principally based on drug products of plant origin. Mineral and metal drug products were scarcely used, and when used were used in the form of herbo-mineral formulations in this period. Stand-alone use of metals and minerals in therapeutics was not much in vogue during the Samhita period. Post Samhita period saw the evolution of an independent branch of medicinal products made of minerals and metals. This branch is famous by the name *Rasashastra* (Iatrochemistry)[4]. Systematic methods of processing of mineral metal materials to produce their therapeutically useful forms, were developed in this period. As a result, use of mineral metal drug products saw considerable rise in Ayurvedic therapeutics. Mineral metal drugs were supposed to be effective instantly and in very small doses[5].

Metals and minerals are usually processed in two steps, referred as *Shodhana* (purification) and *Marana* (incineration). However, few minerals require only first step, the step of *Shodhana* (purification). In the first step thin metal sheets are heated and quenched in different edible liquids to remove their hardness and malleability and make them brittle. Whereas, in the second step, the product obtained from the first step is ground with suitable medicinal materials to produce a homogenous mix, which is then subjected to incineration in closed earthenware containers to produce a powdered edible product known as *Bhasma*. Since the process involves burning of the material, the product obtained after burning in this second step, is labelled as *Bhasma* meaning 'ASH'.

Bhasma is an Ayurvedic drug dosage form produced by incineration of mineral or metal materials. Mineral and metal materials, although possess therapeutic potential, are not edible in their natural form. Hardness and malleability are the principal hurdles in the edibility of these materials. To overcome these hurdles the metals and minerals need vigorous processing. Such a vigorous processing produces a fine edible powder known as *Bhasma*. Apart from change in physical form like reduction in particle size, significant alterations in the chemical configuration of metals and minerals are also observed as a result of the *Shodhana* (purification) and *Marana* (incineration) processes described in Ayurvedic classics. However, this paper will only focus on the reduction in particle size of the metals and minerals in the above-mentioned process and will not discuss chemical changes.

Bhasma are mineral metal drugs in powdered form. Ayurvedic texts describe these particles as fine as particles of *Anjana* (collyrium). Currently, many research articles claiming *Bhasma* as an ancient form of nano-medicine are observed published[6-10]. However, none of the claimants provide any quantitative analysis with regard to the percentage of nano-particles in the *Bhasma* formulations tested by them. Production of *Bhasma* by classical method involves manual intervention. Because of which the final product *Bhasma* contains particles of varying size and shape. It is quite possible that the *Bhasma* may contain few nanoparticles. But the proportion of nano-particles in *Bhasma* may not be significant to claim the whole product of *Bhasma* as nano-medicine. This paper throws light on all such claims with the help of particle size analysis of seven samples of *Bhasma* and like preparations, obtained from different researchers. All these samples were prepared by the researchers themselves for their research studies. The study involves quantitative estimation of distribution of particles of different sizes in these samples.

MATERIAL AND METHODS

Samples

Seven samples of Ayurvedic drugs including four samples of *Tamra Bhasma* (TB-A, TB-B, TB-C and TB-D)with one sample each of *Svarnamakshika Bhasma* (SMB), *Swaymagni-Loha* (SwL) and *Rasasindoora* (RS)a mercurial drug preparation; were collected from various researchers. All these *Bhasmas* and mercurial drugs were prepared by the respective researchers for their studies.

Equipment

BIOVIS PSA 2000 was used for particle size analysis in this study. The equipment comprises of a microscope and high-resolution digital camera with powerful particle analysis with compliant software. It analyses the images of the sample and distinguishes discrete particles. It obtains complex measurements of these particles based on the computer programming software. The instrument can identify particles ranging from 0.5 microns to 5000 microns. Morphological measurements such as length, breadth, area etc. are evaluated in this analysis.

METHDOLOGY

The sample is evenly spread on a glass slide to obtain a thin film. The slide is then placed on the platform of the microscope and set appropriately. The image of the sample is then captured and saved on the computer screen. The slide is then moved a little on the platform of the microscope to expose another field. Image of the particles is again captured and saved on computer screen as earlier. The procedure is then repeated to get images of minimum five fields. The computer software gives the result of the particles size analysis at the end of the test.

RESULTS AND DISCUSSION

Legends used in tables

TB-A: *Tamra Bhasma* prepared by using minimum incineration cycles

TB-B: *Tamra Bhasma* subjected to five additional incineration cycles

TB-C: *Tamra Bhasma* subjected to ten additional incineration cycles

TB-D: Second batch of *Tamra Bhasma* prepared by using minimum incineration cycles

SMB: *Svarnamakshika Bhasma*

SwL: *Swayamagni Loha*

RS: *Rasasindoora*

Particle size analysis of various types of *Bhasmas* and Ayurvedic Mercurial drugs was conducted using image analysis with the help of Biovis PSA 2000 Particle size Analyser. Maximum particle size of 10%, 50% and 90% particles, Percentage of particles in different classes of particle size and Morphological characteristics of particles were assessed in this study. Agglomerates were also found in all the samples. However, we have not taken them into consideration in this study.

Tamra Bhasma

Four samples of *Tamra Bhasma* (TB-A, TB-B, TB-C and TB-D) were analysed in this study. They were analysed for particle size distribution and their morphological characteristics.

D10, D50 and D90 distribution of particles

Analysis of the four samples indicates that *Tamra Bhasma* (TB-C) contains particles smallest in size. 10%, 50% and 90% of 15559 counted particles are observed to be respectively below 130, 205 and 390 nano-meters in size. Whereas, out of 33521 and 40872 counted particles from two batches of *Tamra Bhasma* (TB-A and TB-D) produced using minimum number of cycles of incineration 10%, 50% and 90% particles were below the size of 1.29, 2.7 to 2.9 and 4.6 to 5.18 microns respectively. (Table No.1).

Class wise distribution of particles

Distribution of particles of *Tamra Bhasma* in classes of 0 to 2.5 microns, 2.5 to 5 microns and 5 to 10 microns shows that all the 15559 particles (100%) counted form sample TB-C belong to particle size class range of 0 to 2.5 microns. Whereas, only 36.13 to 38.49 % of particles of samples TB-A and TB-D are found in the range of 0 to 2.5 microns. 30.56 to 37.25% particles from these two batches are in the range of 0 to 2.5 microns. (Table No.2).

Morphological characteristics of particles

Area of perimeter and diameter

As observed in above analysis the minimum perimetric area occupied by the smallest particle of *Tamra Bhasma (*TB-C) is not measurable due to its micro size. Whereas maximum perimetric area occupied by these smallest particles is 0.13 microns. Minimum and maximum diameter of these smallest particle measures 130 nano-meters and 1.56 microns respectively. Minimum and maximum Perimetric area of particles of *Tamra Bhasma* (TB-A) is respectively 660 nano-meters and 598.18 microns. Whereas, its diameter area is minimum

910 nanometers and maximum 27.59 microns. (Table No.3).

Major and Minor axis

The minimum length of smallest particle of TB-C, the *Tamra Bhasma* is unmeasurable due to its micro size. Whereas, its maximum length of major and minor axes is 6.61 and 1.42 microns. This is the shortest length of particles among particles of tested samples of *Tamra Bhasma. Tamra Bhasma* (TB-A and TB-D have largest axes lengths. (Table No.3).

Circularity equivalence

Minimum and maximum Circularity equivalence of sample TB-C of *Tamra Bhasma* is respectively 0.21 and 4.15 which is maximum among the tested samples of *Tamra Bhasma*. (Table No.3).

Svarnamakshika Bhasma

16938 single particles of *Svarnamakshika Bhasma* (SMB) were counted in this analysis. Among them 10%, 50% and 90% particles were observed to be below 159, 368 and 873 nano-meters in size. Whereas, 99.99% of the particles were found to be in the range of 0 to 2.5 microns. Analysis of shape of particles indicates that minimum area of perimeter of SMB particles is unmeasurable. Minimum diameter area is 130 nano-meters. Maximum perimeter and diameter are 5.35 and 2.61 microns respectively. Minimum length of both major and minor axis is unmeasurable. Whereas maximum length of major and minor axis is respectively 7.2 and 2.62 microns. Minimum and maximum circularity equivalence of *Svarnamakshika Bahsma* (SMB) is 0.22 and 2.18.

Swaymagni Loha

19174 single particles of *Swayamagni Loha* (SWL) were counted in this analysis in five fields. Among these particles 10%, 50% and 90% particles were of the size below 501 nano-meters, 1.12 and 2.29 microns. 17723 (92.43%) of these particles were within the range of 0 to 2.5 microns. Whereas only 7.33% were in the range of 2.5 to 5 microns. Minimum and Maximum Perimetric area and diameter area of particles of *Swayamagni Loha* is 0.19 and 93.82 microns (perimeter) and 0.50 and 10.93 microns (diameter) respectively. Minimum and maximum length of major and minor axes of particles is 0.44 and 19.63 microns (Major) and 0.31 and 7.75 microns (minor). Minimum and maximum circularity equivalence of the particles of *Swayamagni Loha* is zero and 2.80.

Rasasindoora

41902 single particles of *Rasasindoora* (RS) were observed in this analysis in 5 fields. 90% of these particles were below the size of 350 nano-meters. Whereas all the particles were within the range of o to 2.5 microns. Minimum perimeter area occupied by particles of *Rasasindoora* (RS) is unmeasurable due to smallest size of its particles. Maximum perimetric area is 1.52 microns. Minimum and maximum length of the diameter of particles of *Rasasindoroa* is 130 nano-meters and 1.39 microns. Minimum and maximum length of axes is unmeasurable. Whereas maximum length of major and minor axes is 11.10 and 1.02 microns respectively. Its minimum and maximum circularity equivalence is 0.18 and 2.50 respectively. Table No.3.

Discussion

Distribution of particles

Samples of *Tamra Bhasma* TB-A and TB-D were prepared by using minimum number of cycles to obtain *Tamra Bhasma* possessing physical and chemical characteristics required to put the *Bhasma* to therapeutic use. Samples of *Tamra Bhasma* (TB-B) and TB-C were produced by subjecting the *Tamra Bhasma* (TB-A) to 5 and 10 additional cycles of incineration with a purpose of enhancing its therapeutic utility with minimum dose. *Tamra Bhasma* (TB-C) was produced by using maximum number of cycles of incineration. The observations indicate that the particle size of *Tamra Bhasma* (TB-C) is the smallest among the tested samples of *Tamra Bhasma*. Moreover, it is observed that all the particles of this *Tamra Bhasma* are found between the range 0 to 2.5 microns. Particle size of *Tamra Bhasma* TB-B is little larger than TB-C. Based on these findings it can be said that the particle size of the *Bhasma* reduces considerably with increasing number of cycles of incineration. (Table No.1). Whereas, *Tamra Bhasmas* TB-A and TB-D both have larger particle size. Class-wise distribution of particles substantiates this conclusion (Table No.2).

Morphological characteristics of particles

Area occupied by particles

This analysis is dependent on the shape of the particles. Not all the particles of *Bhasma* are spherical in shape. The area occupied by these irregularly shaped particles is measured. Area covered by minimum and maximum perimeter and diameter of the particles is measured in this analysis. Minimum and maximum Perimetric area and diameter area of particles TB-A, the *Tamra Bhasma* produced by using minimum number of incineration cycles; is larger in comparison to *Tamra Bhasma* TB-B and TB-C. (Table No.3). Based on this observation it can be concluded that irrespective of shape the smaller particles occupy small area in perimeter and diameter. The particles of *Bhasma* (TB-C) produced by using maximum number of incineration cycles occupy minimum area (Table No.3).

Major and Minor Axis

Observation of minimum and maximum length of major and minor axes of *Tamra Bhasma* indicates that the minimum length of smallest particle of TB-C, the *Tamra Bhasma* prepared by using maximum number of incineration cycles is unmeasurable due to its micro size. Whereas, maximum length of major and minor axes is 6.61 and 1.42 microns. This is the shortest length of particles among particles of tested samples of *Tamra Bhasma*. *Tamra Bhasma* (TB-A and TB-D produced by using minimum number of incineration cycles have largest axes lengths. (Table No.3).

Circularity equivalence

Circularity equivalence refers to perimeter/perimeter of a circle having an equivalent area. The observation indicates that the shape of particles becomes more and more spherical with increase in number of incineration cycles (Table No.3).

Svarnamakshika Bahsma

All the particles of *Svarnamakshika Bhasma* are observed to be below 1 micron in size. Moreover, almost all (99.99%) particles belong to the range of 0 to 2.5 microns. In addition considering the circularity equivalence most of the particles of *Svarnamakshika Bhasma* appear to be spherical in shape.

Swayamagni Loha

90% particles of *Swaymagni Loha* are observed under 2.29 microns among them 92.43% are in the range of 0 to 2.5 microns.

Rasasindoora

Rasasindoora is a mercurial drug preparation. It is produced by intensive heating for prolonged hours in closed container. It is observed that almost 90% particles of *Rasasindoora* are below the size of 356 nano-meters. Whereas, all the particles are observed in the range of 0 to 2.5 microns. Based on this observation it can be concluded that intensive heating for prolonged hours reduces the size of the particles of the product.

Ayurvedic drug forms *Bhasma*, are produced by using minimum number of incineration cycles to pass all the quality parameters like *Rekhapoornatva* (finger ridge fill test), *Varitaratva* (water floatability test)and *Apunarbahvatva* (non-resurrectability test) as described in Ayurvedic texts[11]. The particle size of such *Bhasmas* is observed to be below 10 microns. However, the particle size of *Bhasmas* is observed reducing with increase in numbers of incineration cycles in addition to minimum requirement of incineration cycles. Almost 100% of particles of *Bhasma* produced with maximum incineration cycles are observed below 2.5 microns among them 90% are below 350 nano-meters. Moreover, the smallest particle size observed in this study is that of *Tamra Bhasma* (TB-C) and *Rasasindoora* (RS) which is 130nm. (Table No.2) These observations do indicate that the *Bhasmas* contain considerable number of nano-particles.

Currently many researchers are claiming that *Bhasma*, an Ayurvedic drug dosage form is a form of nanomedicine[6-10]. Dilipkumar *et al* (2014)[12] have given a title "*Bhasma* as ancient Indian nano-medicine" to their published article. The researchers claim that the concept of using nano-metal particles is prevailing since the times of Caraka Samhita. However, Caraka uses the term *Sookshma Coorna* referring to fineness of particles. The fineness of these particles is compared with the particle size of

Anjana (collyrium) applied in eyes. Caraka states that the particles of the *Bhasma* should be so fine that they should not produce any injury to the corneal surface of the eye[2]. This fineness nowhere relates to nano size. Another researcher Bhowmick *et al* (2009)[13] states that *Bhasmas* are biologically produced nanoparticles. He further adds that Mercury compounds contain mercuric sulfide crystals 25 to 50nm in size. Bhowmick *et al* (2009) have used DLS and TEM technics for particle size analysis. In their study both nanoparticulate and un-fractionated fraction of *Jasad Bhasma* were subjected to DLS and TEM analysis. Fractionated particles were obtained by filtration of 1000ppm Jasad Bhasma passed through 0.5 micro-meter filter. The technic allows passage of particles below the size of 500nm. However, size distribution diagram of this filtered part presented by Bhowmick *et al* (2009) shows particles only below 100nm diameter. The filtration procedure adopted by the researcher has resulted in removal of all particles of *Jasad Bhamsa* larger than 500nm. Still the filtered part shows particlesonly below 100-nm. What happened to the particles between 100nm to 500nm remains unanswered in this study. Moreover, the researcher reports that the fraction contained only 11.5 ppm of Jasad Bhasma as estimated by ICP. This fraction contained the particles of the size in the range of 15 to 30nm. All these results indicate that although *Jasad Bhasma* shows nanoparticles. Their quantity 11ppm (1%) in nanoparticulate fraction is not significant.

One more researcher Rakesh Kr Sigh *et al*[14], has studied *Tamra Bhasma*. In his study X-ray diffraction analysis and scanning electron microscopy results have revealed that the crystallite size of *Bhasma* powder was less than 100nm and nano crystallites of agglomerated size in micro-meter. He states that *Bhasmas* are believed to be nanomedicine in ancient India. The researcher has carried out crystallographic phase analysis of *Tamra Bhasma* by using Rigaku TTRX-III X-ray diffractometer. The average crystallite size was found to be ~88nm, which was calculated by employing Scherrer's formula.SEM micrographs reveal that, the size of particles is in micro-meter (~ 30μm) of agglomeration of nanocrystallites.

Table No.1: Maximum particle size of 10%, 50% and 90% particles

S.No	Bhasma	Fields observed	Single Particles counted	Particles below - Microns		
				10%	50%	90%
1	TB-A	5	33521	1.29	2.90	5.19
2	TB-B	5	59659	0.71	1.32	2.24
3	TB-C	5	15559	0.13	0.20	0.39
4	TB-D	5	40872	1.29	2.75	4.67
5	SMB	5	16938	0.16	0.37	0.87
6	SwL	5	19174	0.50	1.12	2.29
7	RS	5	41902	0.13	0.22	0.35

Table No.2: Percentage of particles in different classes

S.No	Bhasma	Class of Particles in Microns					
		0 to 2.5		2.5 to 5		5 to 10	
		Particles	%	Particles	%	Particles	%
1	TB-A	12112	36.13	17576	52.43	3725	11.11
2	TB-B	55937	93.76	3709	6.21	0000	0000
3	TB-C	15559	100	0000	0000	0000	0000
4	TB-D	15735	38.49	22065	53.98	3056	7.47
5	SMB	16937	99.99	1	0.01	0000	0000
6	SwL	17723	92.43	1407	7.33	43	0.22
7	RS	41902	100	0000	0000	0000	0000

Table No.3: Morphological characteristics of particles

S.No		Area (microns)		Area Diam. Microns		AXIS (Major) Microns		AXIS (Minor) Microns		Circularity equivalence	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1	TB-A	0.66	598.18	0.91	27.59	0.81	41.04	0.57	23.94	0	3.07
2	TB-B	0.19	93.82	0.50	10.93	0.44	19.63	0.31	7.75	0	2.80
3	TB-C	0.00	1.85	0.13	1.56	0.00	6.61	0.00	1.42	0.21	4.15
4	TB-D	0.66	343.71	0.91	20.91	0.81	55.33	0.57	17.02	0	2.5
5	SMB	0.00	5.35	0.13	2.61	0.00	7.02	0.00	2.62	0.22	2.18
6	SwL	0.19	93.82	0.50	10.93	0.44	19.63	0.31	7.75	0	2.80
7	RS	0.00	1.52	0.13	1.39	0.00	11.10	0.00	1.02	0.18	2.50

CONCLUSION

Particle size of *Bhasma* reduces with increase in number of incineration cycles. Since only 10% particles were below 130nm, the number of nanoparticles may not be very significant. It can also be concluded that although the *Bhasma* contains particles of varying shapes, the particles. Become more and more spherical with increase in number of incineration cycles. The study concludes that Ayurvedic drug dose form *Bhasma* do contain nano-particles, but not in significant numbers to label *Bhasma* as nano-medicine. In the present study size of only 10% particles of *Bhasma* was found below 130nm. Bhowmick *et al*[13] found 11ppm (1%) nano-particles in nanoparticulate fraction of 1000ppm Jasad Bhasma, filtered through 500nm filter. Prima facie pharmacological action of *Bhasma* can't be credited to 1% nanoparticles. However, the role of these 1% nano-particles needs to be assessed with experimental and clinical studies. Till then it will be too early to designate *Bhasmas* as Nano-medicine.

ACKNOWLEDGEMENT

We are thankful to the management of Jeevanarekha Analytical Services for providing instrumental support for conducting the experiments. We acknowledge all the research scholars who have provided their samples for analysis.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

BIBLIOGRAPHY

1. Momin Ali. A brief history of indian alchemy covering Pre-Vedic to Vedic and Ayurvedic period, (CIRCA 400 B.C.-800 A.D), *Bull. Ind. Inst. Hist. Med,* 23(2), 1993, 151-166.
2. Caraka. "Carka Samhita Cikitsa Sthana 1/3/23, *Chowkhamba Surbharati Prakahan, Varanasi (India),* 2017, 384.
3. Susruta. Susruta Samhita Cikitsa Sthana 10/12, *Chowkhamba Surbharati Prakahan, Varanasi (India),* 2018, 45.

4. Savrikar and Ravishankar. Introduction to 'Rasashaastra'- the Iatrochemistry of ayurveda, *Afr J Tradit Complement Altern Med,* 8(S), 2011, 66-82.
5. Vagbhata. Rasaratnasamuccaya, *Chowkhamba Sanskrit Series Office, Varanasi (India),* 5th Edition, 1976.
6. Singh R K *et al*. Crystal structure and magnetic properties studies on nanocrystalline Lauh (iron) Bhasmae an ayurvedic medicine, *Int J Ayurveda Altern Med,* 4(1), 2016, 17e-22.
7. Kulkarni S S. Bhasma and nano medicine, *Int Res J Pharm,* 4(4), 2013, 10-16.
8. Chaudhary A. Ayurvedic Bhasma nanomedicine of ancient India e its global contemporary perspective, *J Biomed Nanotechnol,* 7(1), 2011, 68e-69.
9. Patwardhan B, *et al*. Reverse pharmacology and systems approach for drug discovery, *Curr Bioact Compd,* 4(4), 2008, 201e-212.
10. Lele R D. Beyond reverse pharmacology, Mechanism-based screening of Ayurvedic drugs, *J Ayurveda Integr Med,* 1(4), 2010, 257e-265.
11. Sadanand Sharma. "Rasatarangini 2/52-57, *Kashinath Shastri, Motilal Banarasidas, Delhi (India),* 11th Edition, 1979, 22-23.
12. Dilipkumar Pal, *et al*. Bhasma: The ancient Indian nanomedicine, *J Adv Pharm Technol Res,* 5(1), 2014, 4-12.
13. Bhowmick T K *et al*. Physicochemical characterization of an Indian traditional medicine, Jasada Bhasma: Detection of nanoparticles containing non-stoichiometric zinc oxide, *J Nanopart Res,* 11(3), 2009, 655-664.
14. Rakesh Kr Singh. Study on physical properties of Ayurvedic nanocrystalline *Tamra Bhasma* by employing modern scientific tools, *J Ayurveda Integr Med,* 10(2), 2019, 88-93.

Please cite this article in press as: Shriram S. Savrikar *et al*. Particle size analysis of *Bhasma* – An Ayurvedic dosage form, *Asian Journal of Pharmaceutical Analysis and Medicinal Chemistry,* 11(1), 2023, 7-14.