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A COMPARATIVE STANADARDIZATION OF ABHRAK BHASMA BY DIFFERENT METHODS

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INTRODUCTION

Ayurveda was developed to safeguard Arogya (health) which is essential for the achievement of the four primary objects of life viz. *Dharma*, *Artha*, *Kama* and *Moksha*. Ayurveda has given great emphasis to the comprehensive knowledge of drugs, preservation and dispensing of prepared drugs under the broad heading known as *Rasashastra and Bhaishajya Kalpana*. The Concept of *Rasashastra* were initially indulged in the achievement of a disease-free body (*Dehavedha*) and conversion of a lower metal to a higher metal i.e., a metal having higher economic value (*Lohavedha*) simultaneously, but later their attempts in the field of *Dehavadha* became dominant.

Among the various *Rasa dravyas*, the *Abhraka* (Mica) occupies a significant position in both streams, *Dhatuvada* as well as *Dehavada*. The importance of *Abhraka* in mercurial processing is clearly depicted in *Rasa Hridya Tantra*, that there is no other agent except mica to clip the wings of Mercury (*pakshachchedana*) which is imminent for swooning and binding of Mercury.[1] Utility of *Abhraka bhasma* is well established through its Continuous use as an excellent medicine since medieval period. Many herbal and other organic material have been quoted in reference for various procedures in preparing *Abhraka bhasma*. It is

wonderful that different pharmacological action has been attributed to different *dravyas* used in the pharmaceutical processing of *Abhraka Bhasma*.

Abhraka Bhasma, acts on both the Doshas (bodily humors) and the disease to arrest the pathogenesis. It has been used for several chronic diseases like tuberculosis, breathing problems like dyspnoea, asthma, piles, skin diseases, Arthritis etc. Though wide therapeutic utility of *Abhraka bhasma* has been mentioned in classics, it is reported that, internal administration of improperly prepared *bhasma* leads to *Prameha*[2], *Mandagni*[3] and it is fatal to the human being like a poison. Previous studies reported safety of AB in animal models at level of Acute toxicity study. Role of *Shodhana* in safety of *Abhraka Bhasma* (AB) was also reported in animals. Hence, the present study is aimed to compare the pharmaceutical, analytical study of AB prepared by different methods using different number of *putas*.

Need of Study

A few methods for preparation of *Abhraka bhasma* were described in different rasa texts and a variety of *dravyas* have been used for its *sodhana* and *marana* process. Though, number of studies have been carried out in direction of safety of *Bhasmas,* concerns are always being raised on ayurvedic formulations for the presence of heavy metals. Hence, the present study is aimed to compare the pharmaceutical, analytical of AB prepared by different methods using different number of *putas*.

OBJECTIVES

1) To prepare sample of *Abhraka Bhasma* (AB-1) following SOP's as per reference of *Ras Ratna samuchya* 2/26.
2) To prepare sample of *Abhraka Bhasma* (AB-2) following SOP's as per reference of *Ras Ratna samuchya* 2/22.
3) To anlayse the prepared samples of *Abhraka Bhasma*.

MATERIALS AND METHODS

The present styudy was conducted in two steps as following steps

1. Pharmaceutical Study
2. Analytical study

1. Pharmaceutical Study

Material used in this preparation were based on availability, feasibility according to classical indication of Rasa Shastra, traditional value, and expert opinions. Raw materials include *abhraka* and drug used for *shodhana* and *marana.* A genuine sample of *Krishnavajrabhraka* was procured from the Pharmacy of N.I.A, Jaipur. Raw materials *Triphala* and drugs needed to prepare *Kanji, Guda* were also procured from Pharmacy. Fresh *Eranda patra* was collected before sunrise from the periphery of Jalmahal at Jaipur. Fresh *Kasamardaa patra* was collect from periphery of N.I.A, Jaipur.

The whole Pharmaceutical Study was conducted in following steps.

Practical No.1: **Preparation of *Kanji***

Practical No.2: **Preparation of *Triphala***

Practical No.3: ***Shodhana* of *Abhrak Bhasma***

Practical No.4: ***Dhanyabhraka Nirmana***

Practical No.5: **Preparation of *Eranda Patra Swaras***

Practical No.6: ***Marana* of *Abhraka* Sample (AB – 1)**

Practical No.7: **Preparation of *Kasamarda patra swara***

Practical No.8: ***Marana* of *Abhraka* Sample (AB – 2)**

Practical No.1: Preparation of *Kanji*[4]

Material Required: The details of ingredients are mentioned in the Table No.1.

Method of preparation

Three Clean china clay pots of 6 litres capacity each was carefully washed with water and dried. Preconditioning of the pot was done by fumigating with *Trikatu churna* (Powder of *Zingiber officinale*, *Piper nigrum* and *piper longum*). Rice was cooked in 5 times water. On completion of cooking rice, was removed from fire, allowed to cooling. Further 9 times of boiled and cooled water was added to the cooled cooked rice. In this way, Total water added was 14 times of raw rice as instructed for *Anna kalpana.*

Preparation of *Kulattha kwatha*

Initially 1 Kg of *Kulattha* was weighed accurately by using digital weighing machine and taken in a wide mouthed steel vessel after pounding. Water was added in the ratio of 1:8 i.e 8l of water was added to *kulattha*. A mark was made on the vessel exactly at 2l (1/4). The vessel was kept on *madhyamagni* till the liquid was reduced up to the mark. The oil was

heated by taking it in an iron pan. The *rajika* was added to hot oil and on crackling of *rajika*, turmeric was added and the whole material was added to the cooked rice. Salt, *sunthi* and *jeerak* were ground into fine power. Leaves of *vamsha* were cut into small pieces. *Hingu* was fried in ghee. *Masha* powder was made into thick paste by adding some water and continuous stirring in circular motion. Then it was deep fried in mustard oil in form *chakrika*. Whole material was transferred to a sterile storage container made of china clay. The container was tightly packed by *Multani mitti* and kept aside for fermentation. After 30 days, on completion of process, the material was sieved through nylon sieve of mesh size 40 and left undisturbed in a sterile container for one day. When sediments were settled in the bottom of the vessel, the supernatant clear liquid was siphoned out using a transparent rubber tube and stored. The total quantity of *Kanji* obtained was 10 litres.

Practical No. 2: Preparation of *Triphala kwatha*[5]

Material used

Triphala - 4.0 kg

Water for decoction - 32 l

Water reduces to - 8.0 l

Procedure

Initially 4kg of *Triphala* was weighed accurately by using digital weighing machine and taken in a wide mouthed steel vessel after pounding. Water was added in the ratio of 1:8 i.e., 32 litres of water was added. A mark was made on the vessel exactly at 8 litres (1/4 part). The vessel was kept overnight for proper soaking of the drug. Next day, in morning, the vessel was kept on *madhyamagni* till the liquid reduced to 1/4 part. Then the *kwatha* was filtered with a fine cloth.

Observations of *Triphala Kwatha* Preparation

- Colour - Brown
- Taste - *Kashaya, amla*
- Odour - Characteristic
- pH - 3

Practical No. 3: *Shodhana* of *Abhrak Bhasma*[6]

Materials Used

Raw *Abhraka* -500x2 batch = 1 kg

Triphal kwatha - 4 litre

Procedure

500gm. of raw *Abhraka* was weighed accurately and heated in an iron pan on a gas burner till red hot stage. In order to produce the uniform temperature, it was covered with another iron pan. Four litres of *Triphala* decoction were measured and taken in a stainless-steel vessel. After achieving the red-hot stage, *Abhraka* was immediately quenched into *Triphala kwatha* and the vessel was immediately covered. The colour of *Abhraka* became blacker after each quenching. Silver luster of *Abhraka* went on decreasing after each quenching. *Abhraka* becomes softer and brittle after each quenching and changed into smaller pieces. After few minutes, the vessel was uncovered and *Abhraka* was separated. The whole process was repeated further for six times. Next Batch of 500 g. of *Abhraka* was also processed with same procedure. The results obtained after *Abhrak Shodhan* is shown in table No.2.

Practical No. 4: *Dhanyabhraka Nirmana*[7]

Materials Used

Shuddha Abhraka -		1100 gm.
Dhanya	-	275 gm
Kanji	-	4 Litre

Procedure

The weighed amount of *Shuddha Abhraka* and *Dhanya* was transferred to an enamel tray and thoroughly mixed with each other manually. After proper mixing the whole material was transferred to the jute bag. The mouth of the jute bag was closed tightly with the help of jute yarn to form a *pottali*. Required amount of *Kanji* was taken in a steel vessel and the *pottali* was dipped in it completely. It was kept as it is for three days. After three days i.e. 72 hours the *pottali* was rubbed vigorously between palms protected by rubber gloves. Every time when the colour of Kanji changes to black, new vessel with kanji was taken to give fresh media for the faster withdrawal of *dhanyabhraka*. This process was continued till complete extraction of *Dhanyabhraka* particles occurred. This was confirmed by rubbing the bag between hands and getting some hard particles inside, which were nothing but silica granules and tough particles of *Abhraka.* After that all the vessels were kept stable for the settlement of *Abhraka* particles. After settlement of particles, the upper clear water was siphoned from all the vessels. Residue of all the vessels was collected and kept in the drier.

At last, a lustrous grayish black coloured powder of *Dhanyabhraka* was obtained.

RESULT

Quantity of *Dhanyabhraka* obtained	-	800 g.
Loss occurred	-	300g.
Loss occurred in %	-	27.27%

Practical No. 5: Preparation of *Eranda Patra Swaras*[8]

Materials used

Eranda Patra - 1kg

Procedure

Freshly procured 1 kg of *Eranda patra* was washed and cleaned with cloth. It was cut into small pieces and added to mixer grinder to extract *swarasa*. Every time fresh *swarasa* was prepared for each *bhavana* of *Abhraka*. The output of *swarasa* obtained was 200 ml as shown in Table No.3.

Practical No.6: *Marana* of *Abhraka* Sample (AB – 1)[9]

Materials Used

- *Dhanyabhraka* - 100gm.
- *Guda* - 100gm
- Fresh *Eranda Swarasa* - 200 ml for 1st bhavana then according to need
- Fresh *Vata patra* - 3 fresh leaves

Procedure

Procedure for 1st to 15th puta-

100g. of *Dhanyabhraka* was weighed properly. Fresh *Eranda Swarasa* was taken in a measuring cylinder. The weighed quantity of *Dhanyabhraka* and the required measured amount of *Erand swarasa* and *guda* were put together in the *khalva* and triturated for 4 hours. After that the mixture was transferred on a thick plastic sheet and spread uniformly with the help of a spatula and cut in small square pieces with the help of a blunt knife. Then the pellets were placed in dryer for proper drying. All the dried pellets were weighed properly. Two *sharava* were taken and rubbed over the floor to make their surfaces even, then all the dried pellets were arranged in *sharavas* completely covered by *Vata patra* keeping some empty space inside them. Two other *sharava* prepared in the same manner

were put over the pellet containing *sharavas*. *Sandhibandhana* was done with the help of mud smeared cloth and dried.

The *sharava samputas* were subjected to heat in a muffle furnace. The temperature was allowed to rise to 750^0C and then it was maintained at peak for 60 minutes. Thereafter the furnace was shut off and subjected for self-cooling. On the next day, pellets were collected when temperature of furnace came down and weighed properly.

RESULTS

- Quantity of *Abhraka Bhasma* Obtained - 96 gm.
- Quantity of samples collected for analysis - 20 gm.
- Quantity of sample collected for experimental study - 20 gm.

Practical No. 7: Preparation of *Kasamarda patra swarasa*[10]

Materials used

Kasamarda Patra - 2kg

Procedure

Freshly procured 2 kg of *Kasamarda patra* was washed and cleaned with cloth. It was cut into small pieces and added to mixer grinder to extract *swarasa.* Every time fresh *swarasa* was prepared for each *bhavana* of *Abhraka*. The output of *swarasa* obtained was 200 ml as shown in Table No.4.

Practical No. 8: *Marana* of *Abhraka* Sample (AB – 2)[11]

Materials Used

Dhany Abhraka	-	100 gm.
Fresh *Kasamardaa Swarasa*	-	Q.S. for *bhavana*

Procedure

Procedure for 1^{st} to 33^{rd} puta

100gm. of *Dhanyabhraka* was weighed properly. Fresh *Kasamardaa Swarasa* was taken in a measuring cylinder. The weighed quantity of *Dhanyabhraka* and the required measured amount of *Kasamardaa swarasa* were put together in the khalva and triturated for 4 hours. After that the mixture was transferred on a thick plastic sheet and spread uniformly with the help of a spatula and cut in small square pieces with the help of a blunt knife. Then the

pellets were placed in dryer for proper drying. All the dried pellets were weighed properly. Two *sharava* were taken and rubbed over the floor to make their surfaces even, then all the dried pellets were arranged in *sharavas* completely covered. Two other *sharava* prepared in the same manner were put over the pellet containing sharavas. *Sandhibandhana* was done with the help of mud smeared cloth and dried. The *sharava samputas* were subjected to heat in a muffle furnace. The temperature was allowed to rise up to 750^0C and then it was maintained at peak for 60 minutes. Thereafter the furnace was shut off and subjected for self-cooling. On the next day, pellets were collected when temperature of furnace came down and weighed properly.

RESULTS

- Quantity of *Abhraka Bhasma* Obtained - 88 gm.
- Quantity of samples collected for analysis - 20 gm.

2. ANALYTICAL STUDY

All parameters are taken according to "Protocol of testing of ASU medicines[12]," & Ayurvedic Pharmacoepia of Indian Medicines[13], published by Govt of India, Dept of Ayush. The tests were conducted at Drug Testing Laboratory, Dept. Of Rasa Shastra& Bhaishajya kalpana. XRD, EM- EDX, ICP and Particle size analysis has been done at SICART, Gujrat.

A. Organoleptic Characters: Organoleptic characters include *Rupa, Rasa, Gandha, Sparsha*. All these parameters are dealt with different standpoint to test the perfectness of *Bhasma.* The results of organoleptic characters of samples of *Abhrak Bhasma* is shown in Table No.5.

B. *Bhasma Pariksha*: This test is applied to study the lightness and fineness or microfineness of *Bhasma.* The results of *Bhasma Pariksha* of samples of *Abhrak Bhasma* is shown in Table No.6.

C. Physico chemical parameters

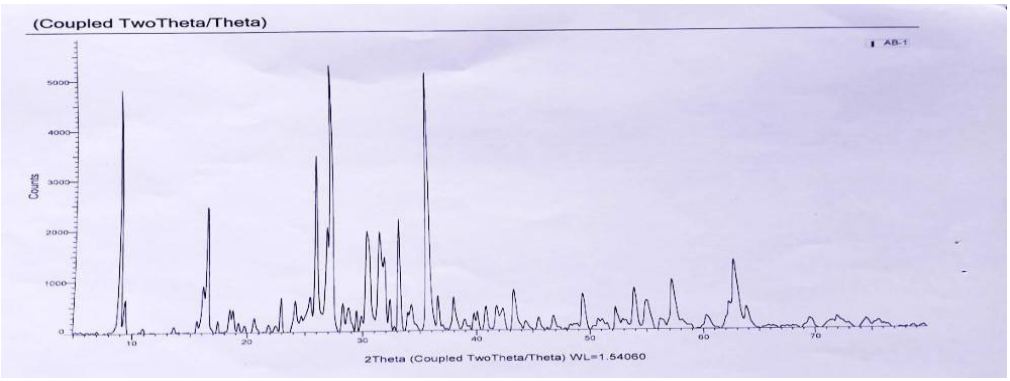
- **Determination of Loss on Drying[14]:** It indicates the total moisture (Water) contents in drug. The results of loss on drying of samples of *Abhrak Bhasma* is shown in Table No.7.
- **Determination of Total Ash:** Ash values use to determine quality and purity of a crude drug. The results of Total Ash of samples of *Abhrak Bhasma* is shown in Table No.7.

- **Determination of Acid Insoluble Ash[15]:** The acid insoluble materials indicate the presence the of siliceous of matter in sample. The results of Acid Insoluble Ash of samples of *Abhrak Bhasma* is shown in Table No.7.
- **Determination of pH Value:** This is a convenient method of indicating the relative degree of acidity and alkalinity of aqueous solutions. The results of pH Value of samples of *Abhrak Bhasma* are shown in Table No.7.

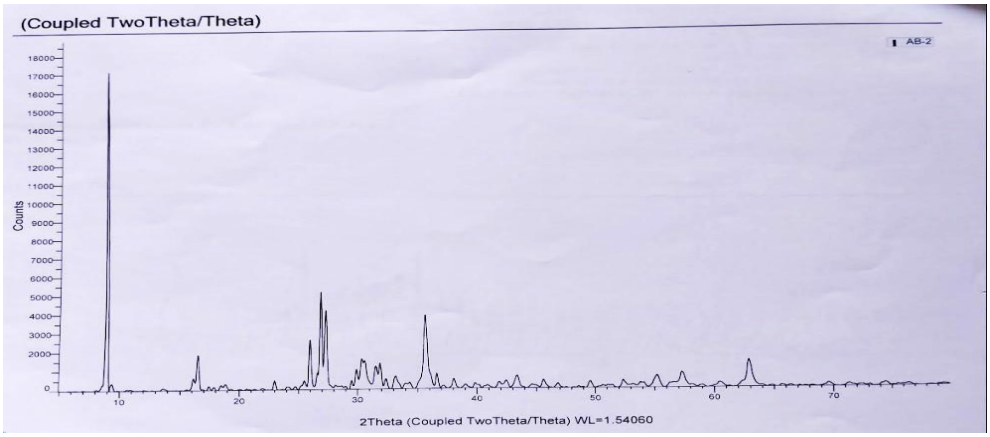
D. Elemental analysis (qualitative and quantitative)

I. X-RAY DIFFRACTION

Diffraction pattern is produced when a crystalline material is irradiated with a collimated beam of X-Ray. The diffraction angle can provide information such as crystal structures, phase purity, grain size etc. The results of X-ray diffraction of samples of *Abhrak Bhasma* are shown in Table No.8 & 9.



Graph No.1: Showing Xray Diffratogram of Sample (AB-1)



Graph No.2: Showing Xray Diffratogram of Sample (AB-2)

II. SEM (Scanning Electron Microscope)

It can produce high resolution images of a sample surface, which means that closely spaced features can be examined at a high magnification.

Sample AB-1

Images at resolution of 5 to 50 µm represents particles which are monoclinic to crystalline square sized. Particles are moderate in size and easy to locate on SEM image. Few particles are showing separated crystal appearance which are monoclinic scaly in shape.

Showing SEM Micrographs of SampleAB-1

Fig. No.1

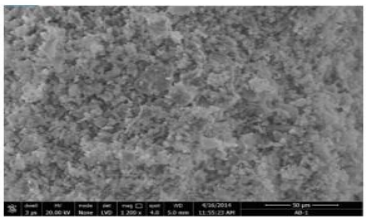


Fig. No.2

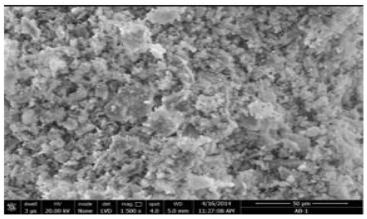


Fig. No.3

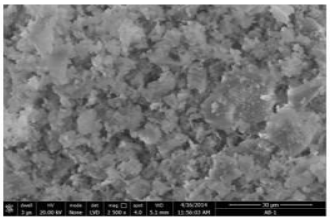


Fig. No.4

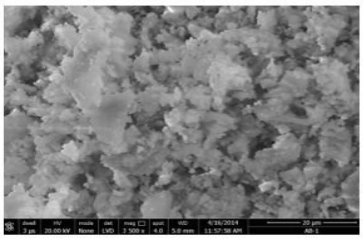


Fig. No.5

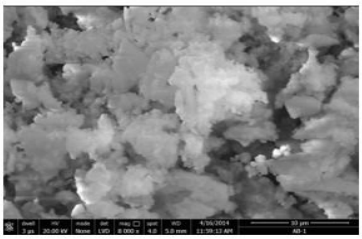
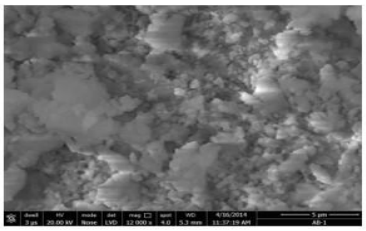


Fig. No.6



Sample AB-2

Images show the resolution of 5 to 100 µm represents that particles monoclinic to crystalline granular size particle form found which confirm for the good stability of particles. Few images have appeared some particles showing separated crystals appearance and are monoclinic in shape.

Showing SEM Micrographs of SampleAB-2

Fig. No.1

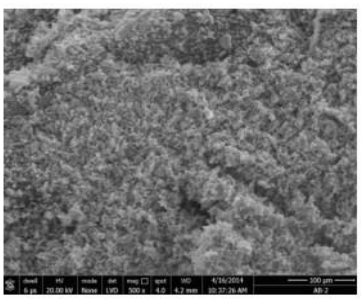


Fig. No.2

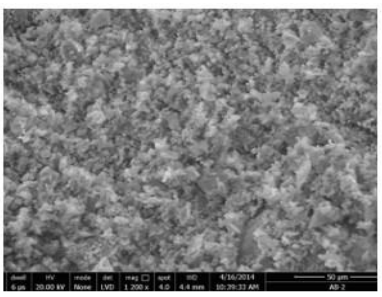


Fig. No.3

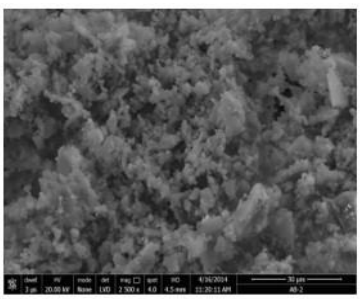
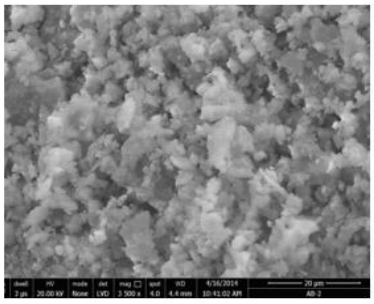
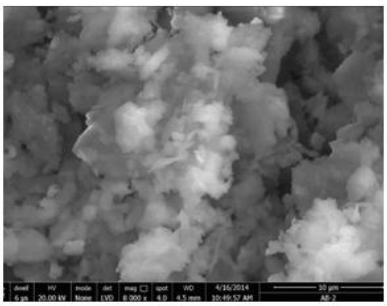
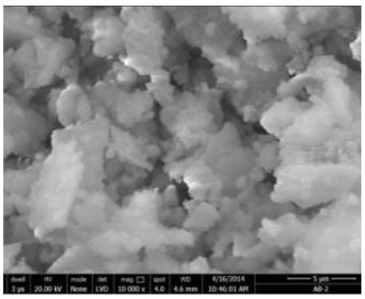
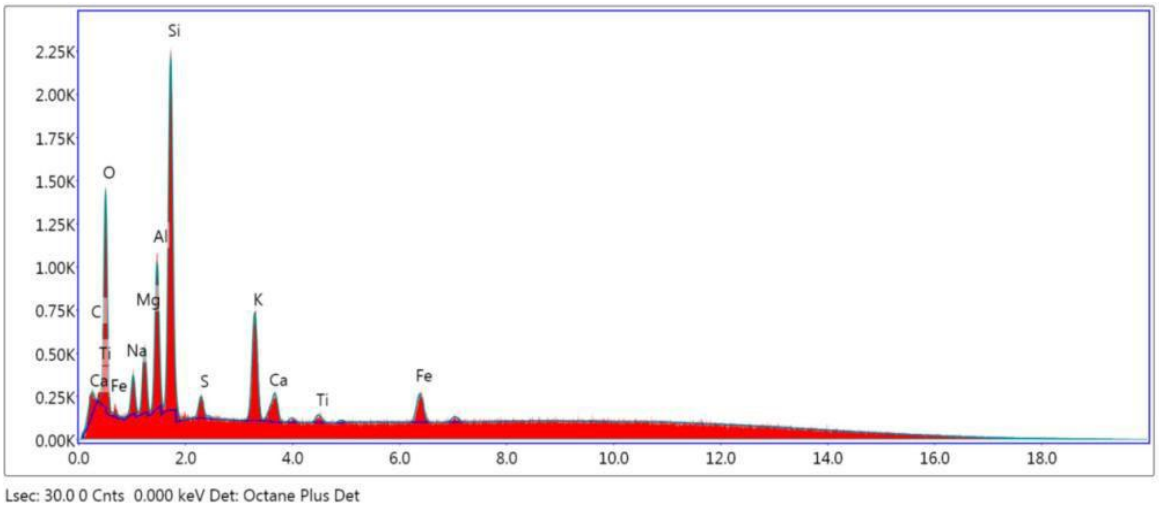


Fig. No.4 **Fig. No.5** **Fig. No.6**

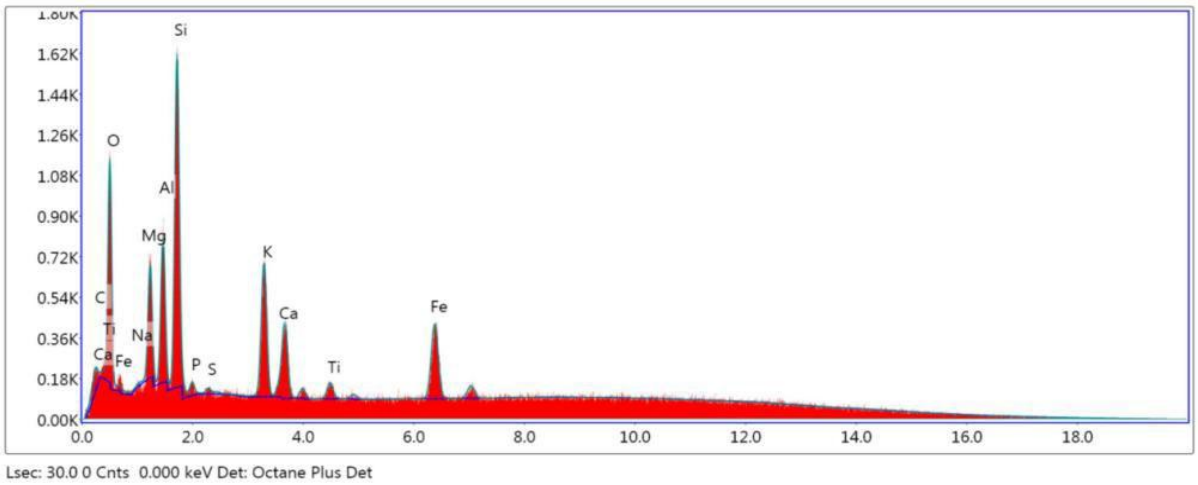




III. EDAX (Energy-dispersive X- ray Analysis)

It is an analytical technique used for the elemental analysis or chemical characterization of a sample. The results elemental analysis of samples of *Abhrak Bhasma* by E-DAX are shown in Table No. 10 & 11.



Graph No.3: showing the various peaks by sample AB-1 obtained in EDAX analysis.



Graph No.4: showing the various peaks by sample AB-2 obtained in EDAX analysis.

IV. ICP

The ICP-MS instrument employs a plasma as the ionization source and a mass spectrometer analyzer to detect the ions produced. The results of elements in ppm level (ICP OES) of Sample AB-1 and AB-2 are shown in Table No. 12.

V. Particle Size Distribution Analysis

This sophisticated instrumental method is performed to evaluate the size distribution of particles in *Bhasma* samples. The results of particle size distribution analysis of Sample AB-1 and AB-2 are shown in Table No. 13. Particle size of 50% of AB-1 Sample was 6.57µm while 50% of Sample AB-2 was having particle size 4.65µm. Result shows smaller particle size of AB-2 compared to AB-1.

DISCUSSION ON PHARMACEUTICAL STUDY

Triphla kwatha was used for *nirvapa* of *abhraka* due to high percentage of water-soluble contents and also suspended solids. *Kanji* was prepared as per the reference of *Rasaratna samucchaya, Rajika, Saindhava, Kulattha, Audana, Haridra, Vansha, Shunthi, Jeeraka, Hingu, Masha, Sarshapa Taila* were used. It also includes some sub steps also like Preparation of *Kulattha Kwattha*, Preparation of Rice etc. *Shodhana* of *Abhraka* is more a size reduction process while separating the physical impurities. After the process of *shodhana* the gain in weight of *abhraka* was observed due to addition of some amount of solids of *triphala kwatha* which was added to the *abhraka* in the form of charcoal. A weight gain of 11% and 8% were observed in two samples of *Abhraka* respectively. During the phase of heating of *Abhraka*, at the same time water molecule evaporate and come out through mineral separating *Abhraka* in various layers along its parallel cleavage planes. Quenching the *Abhraka* into liquid media immediately develops fracture in the crystal structure owing to the fact of sudden temperature change. Sudden change in temperature causes breaking of other strong bonds and this destroys its flexibility and makes it more brittle. After *Dhanyabhrakikarana* the process of *marana* was done. The trituration liquids were *Erand patra swarasa* and *guda* (sample AB-1*), Kasmarda Swarasa* (sample AB-2) Every time fresh *swarasa* was used for trituration.

In Sample (AB-1) it was observed that the quantity of *Swarasa* 200ml and *guda* equal amount of *shodhita abhraka* (100g) used for 1st bhavana was more than subsequent bhavana. *Dhanyabhraka* being light in nature occupied the whole *khalva* and the more

swarasa was required for wetting and trituration of material. The quantity of *Swarasa* required for 2-10 bhavana was almost 50% of previous. Quantity of *Swarasa* required for 11-15 bhavana was almost 40% of previous. In 1st to 6th *puta* the weight of *Abhraka* was remarkably increased, because of the *guda* was mixed in equal quantity. Because of it pallets was neither getting dried and nor soft, and pellets did not achieved the desired colour. So after 6th *puta* amount of *guda* was reduced to 1/8, after that from 6 to 10th *puta* weight of *abhraka* was decreased gradually in each puta, pellets became soft and dried easily and achieved red brick colour. To make *Abhraka bhasma* free from *Chandrika* is a tedious job but the *Marana* of *Abhraka* with the help of *Erand patra swarasa* and *guda* proved very much beneficial. The *Bhasma* passed the *Rekhapoorna* test after 10rd *puta* that reveals that it became fine (*Sukshma*). 50% *Varitara* test was passed after 10th *puta, 100% Varitara* test was passed after 15th *puta* that reveals that from that time *Bhasma* became Light (*Laghu*), soft, fine also. About 50% of *Chandrika* was disappeared in the 6th *puta* only and there after decreases gradually and after 10th puta it became totally *Nishchandra* and after 15th put *bhasma* was very fine and soft.

In Sample (AB-2)- It was observed that the quantity of *Kasmard Swarasa* 200ml and *shodhita abhraka* (100g) were used for 1st bhavana. The quantity of *bhavana dravya* was reduced in later puta and in the last puta only 85 ml *swarasa* was utilized for bhavana. As per the classical reference only 10 puta is mentioned for achieving the *bhasma* stage however in the present experiment it took 33 puta for achieving the characteristics of *bhasma* properly. During Every *puta to* weight loss in *Abhraka* was observed, after giving 33 puta there was a loss of 12 g *abhraka* was observed respectively. In some further *puta* changes in weight were also recorded but that were negligible. The *Bhasma* passed the *Rekhapoorna* test after 7rd *puta* that reveals that it became fine (*Sukshma*). 50% *Varitara* test was passed after 10th *puta 100% Varitara* test was passed after 20th *puta* that reveals that from that time *Bhasma* became Light (*Laghu*), soft, fine also. About 50% of *Chandrika* was disappeared in the 20th puta only and there after decreases gradually and after 26th puta it became totally *Nishchandra* and after 33th *puta bhasma* was very fine and soft. At the end of the 33th *puta* when it was examined it passed all the parameters that means it was ready to use therapeutically.

DISCUSSION ON ANALYTICAL STUDY

In concern with **organoleptic tests** of the *Bhasma* appeared smooth powder, lustreless, red brick colour, and produced no perceptible sound during chewing. Abhraka Bhasma Sample (AB-1 & AB-2) passed classical parameters viz. *Varitaratva, Rekhapurnatva,* Nichandrata. Specific brick red colour and tastelessness indicate formation of metallic compound. No lustre implies absence of free metal in the *Bhasma*. *Varitara* indicate light weight and fineness. The Sample AB-1 & AB-2 showed a marginal difference in the Value of **loss on drying**. The reason could be varying amount of ***bhavana dravya*** and inevitable manual error during analysis. *Abhraka bhasma* had been prepared by keeping in high temperature ranging from 700ºC to 900 ℃ it was already converted completely into ash. Therefore, both the sample show same values for **total ash**. The *abhraka bhasma* sample AB-1 has showed higher values of **acid insoluble ash** when compared to the other samples (AB-2). That means the sample AB-1 contains more silica than the other sample. The reason is the AB-1 was triturated in a stone mortar and pestly due to scarcity of means. Rubbing of stone with trituration liquids will certainly add some silica content to the main formulation.

X Ray diffraction (XRD)

Various sharp peaks of **sample (AB-1) as per graph no.1** high intensity in the XRD pattern suggests that the *Abhraka Bhasma* is present in crystalline form. Peaks of Alumina ferric Oxide and K Na Salt of silica were obtained. Sample of *bhasma* showed complex chemical composition. Sharp peaks observed that major compounds of majorly at 100% intensity on 27.291, 2theta value with crystalline monoclinic shape of mica. Sharp peaks observed in **Sample (AB-2) as per graph no.2** that major compounds of majorly at 100% intensity on 8.940, 2 theta value with crystalline monoclinic shape of mica. Peaks of K or Na Salt of silica was obtained.

SEM Sample (AB-1): Fig no.1 to 6 are showing the images obtained by scanning electron microscopy on various zoom i.e., 1200x to 12000x. That shows the morphology and arrangement of the particles of the *Abhraka Bhasma*. Images show the resolution of 5 to 50 µm represents that particles monoclinic to crystalline square size particle form found which confirm for the good stability of particles. Few images have appeared where some particles were showing separated crystals which are monoclinic scaly in shape.

SEM Sample (AB-2): Fig no.7 to 12 are showing the images obtained by scanning electron microscopy on various zoom i.e., 500x to 10000x Images show the resolution of 5 to

100 µm represents that particles monoclinic to crystalline granular size particle form found which confirm for the good stability of particles. Few images have appeared where some particles were showing separated crystals which are monoclinic scaly in shape.

Energy-dispersive X-ray spectroscopy (EDAX) Sample (AB-1)

The graph No.3 says that weight wise highest percentage of O that is 35.92% then Fe- 16.49 %, Si- 13.74 %, K- 12.42%, Al- 7.34 %, Mg 5.95%. **P, C, Cl, Fe** is below 1% in weight wise quantified distribution. The atomic percentage wise distribution shows the highest percentage of O with 54.75%, then Si- 11.93%, K- 7.74%, Fe- 7.20%, Al- 6.64% and Mg- 5.97%. **C,P,Cl** are below 1%. It does not mention about the percentage of the material which is unrecognized by it. O, Fe and Si, K were key ingredients of the *Bhasma*.

Energy-dispersive X-ray spectroscopy (EDAX) Sample (AB-2)

It says that weightwise highest percentage of O that is 35.80% then Fe- 15.39 %, Si- 15.03 %, K-870%, Al- 7.20 %. Mg 6.55%. **Na, P, S,** are below 1% in weight wise quantified distribution. The atomic percentage wise distribution shows the highest percentage of O with 52.78%, then Si- 12.62 %, K- 7.74%, Fe- 6.50 %, Al- 6.30% and Mg- 6.35%. O, Fe and Si, K were key ingredients of the *Bhasma*.

ICP Sample (AB-1 & AB-2)

Table No.12 is showing the amount of various element present in ppm level in *Abhraka bhasma*. Principle of the ICP-OES that it assumes the sample 99% pure and detect the impurities in remained 1% at the ppm level. ICP traced As, Cd in high amount. As, Cd may have their origin from the herbs and other additives used during the preparation, may be from *Bhawana Dravya* used. Source of the As may be also from cross contamination in laboratory. Particle size distribution.

Particle size Sample

Table No.13 is showing the particle size distribution in ***Abhraka bhasma*** **Sample (AB-1)**. It shows that all the *bhasma* particles are of the diameter below 91.41µm. 10% of the particles are below 1.45µm diameter. That shows the fineness of the *bhasma*. Volumetric mean diameter (VMD) of *bhasma* particles is 13.81µm and the standard mean diameter (SMD) is 3.65*µm*. Density of the *bhasma* particles is 2.7100 g/cm^2. Cumulative distribution and density distribution Graph reveals that most of the particles of the *bhasma* are of almost same size and evenly distributed. ***Abhraka bhasma*** **Sample (AB-2)** *bhasma*

particles are of the diameter below 60.38µm. 10% of the particles are below 1.41µm diameter. That shows the fineness of the bhasma. Volumetric mean diameter (VMD) of *bhasma* particles is 8.90µm and the standard mean diameter (SMD) is 3.19*µm*. Density of the *bhasma* particles is 2.7100 g/cm^2. Cumulative distribution and density distribution Graph reveals that most of the particles of the *bhasma* are of almost same size and evenly distributed.

CONCLUSION

- Preparation of Abhraka bhasma (Sample AB-1) required 15 putas to pass the characteristic tests for bhasma while AB-2 required 33 putas.
- *Nischandrikarana* of *Abhraka bhasma* is a very tedious job. However, presence of *guda* in AB-1 helped in reducing the *Chandrika* from *bhasma* at a much faster rate as compared to other *bhavana dravyas.*
- Analytical study of *Abhraka bhasma* showed Sample (AB-1&2) L.O.D 0.133,0.16, pH 7.94,7.89, Ash value 99.93%, 99.93% Acid insoluble 52.3%,49.0% respectively.
- In XRD of two samples Peaks of Alumina, ferric Oxide and K and Na Salt of silica were obtained.
- EDAX showed weightwise highest percentage of O -35.92% followed by Fe- 16.49 %, Si- 13.74 %, K-12.42%, Al- 7.34 % and Mg 5.95% in AB-1,AB-2 also showed highest percentage of O -35.80% followed by Fe- 15.39 %, Si- 15.03 %, K-8.70%, Al- 7.20 % and Mg 6.55%.
- Particle size analysis of 2 samples showed that all the *bhasma* particles of AB- 1 are of the diameter below 91.41µm, while that of AB-2 was 60.3 µm.

Table No. 1: Showing Ingredients of *Kanji.*

Sr.No	Ingredients	Latin name	Part used	Qty.(Kg)
1.	*Rice*	*Oryza Sativum*	seeds	1.0
2.	*Saindhava*	*Rock Salt*	Crystal	0.5
3.	*Rajika*	*Brassica Juncea*	Seeds	0.5
4.	*Kulattha*	*Dolichus Biflorus*	Seeds	1.0
5.	*Haridra*	*Curcuma longa*	Rhizome	0.25
6.	*Vamsha*	*Bambusa arundinaceae*	Leaves	0.25
7.	*Shunthi*	*Zingiber officinale*	Rhizome	0.25
8.	*Jeeraka*	*Cuminum cyminum*	fruits	0.125
9.	*Hingu*	*Ferula narthex*	Resin	0.062
10.	*Sarshapa Taila*	*Brassica campestris*	Seed oil	0.225
11.	*Masha*	*Phaseolus mungo*	Seeds	0.25
12.	*Jala*	H_2O	Water	14L

Table No. 2: Showing the Results of 2 Batches of *Abhraka shodhana.*

Sample	Initial weight	Final weight	Loss /gain	Percentage loss/gain
Sample (AB-1)	500g	556g	56g	11.2%
Sample (AB-2)	500g	544g	44g	8.8%

Table No 3: Showing Result of *Eranda Patra swarasa* preparation.

Sample	Initial weight	*Swarasa* obtained	Colour of *Swarasa*	pH
Erand Patra	1kg	200 ml	Dark green	6

Table No 4: Showing Result of *Kasamarda Patra swarasa* preparation.

Sample	Initial weight	Swarasa obtained	Colour of *Swarasa*	pH
Kasamarda Patra	2kg	200 ml	green	5

Table No. 5: Showing Organoleptic parameters of Sample (AB-1&AB-2)

Parameters	Sample AB-1	Sample AB-2
Varna (Colour)	Brick red	Brick red
Rasa (Taste)	Tasteless	Tasteless
Gandha (Odour)	Odourless	Odourless
Sparsha (Touch)	Very soft	Very soft

Table No. 6: showing Bhasma Pariksha of Sample AB-1 and AB-2.

Varitaratva	Positive	Positive
Rekhapurnatva	Positive	Positive
Nishchandratva	Positive	Positive
Apunarbhava	Positive	Positive

Table No. 7: Showing the Phsico-chemical Parameters of Sample (AB-1&AB-2).

Sr.no.	Test Parameters	Sample AB-1	Sample AB- 2
1.	Loss on drying at 105o (% w/w)	1.1	0.90
2.	Total Ash (% w/w)	94.30	92.50
3.	Acid-insoluble ash (% w/w)	52.30	49.30
4.	pH (10 % aqueous solution)	8.0	8.1

Table No. 8: Showing Major phases obtained from XRD of Sample (AB-1)

Compound name	Obs. Max	d (Obs. Max)	Net Height	FWHM	Intensity
	2-Theta °	Angstrom	Cps	2-Theta °	%
K or Na salt of silica	8.913 °	9.91388	4746.161	0.205	90.4
K or Na salt of silica	16.482 °	5.37397	2448.019	0.244	46.6
Magnesium oxide	25.966	3.42871	3445.826	0.243	65.6
Alumina	27.291	3.26518	5251.241	0.265	100.0

Table No. 9: Showing Major phases obtained from XRD of Sample (AB-2)

Compound name	Obs. Max	d (Obs. Max)	Net Height	FWHM	Intensity
	2-Theta °	Angstrom	Cps	2-Theta °	%
K or Na salt of silica	8.940°	9.88315	16833.200	0.200	100.0
Magnesium oxide	26.926°	3.30858	5112.600	0.830	30.4
Alumina	27.347	3.25863	4124.758	0.829	24.5
Ferric oxide	35.714	2.51207	3849.706	0.334	22.9

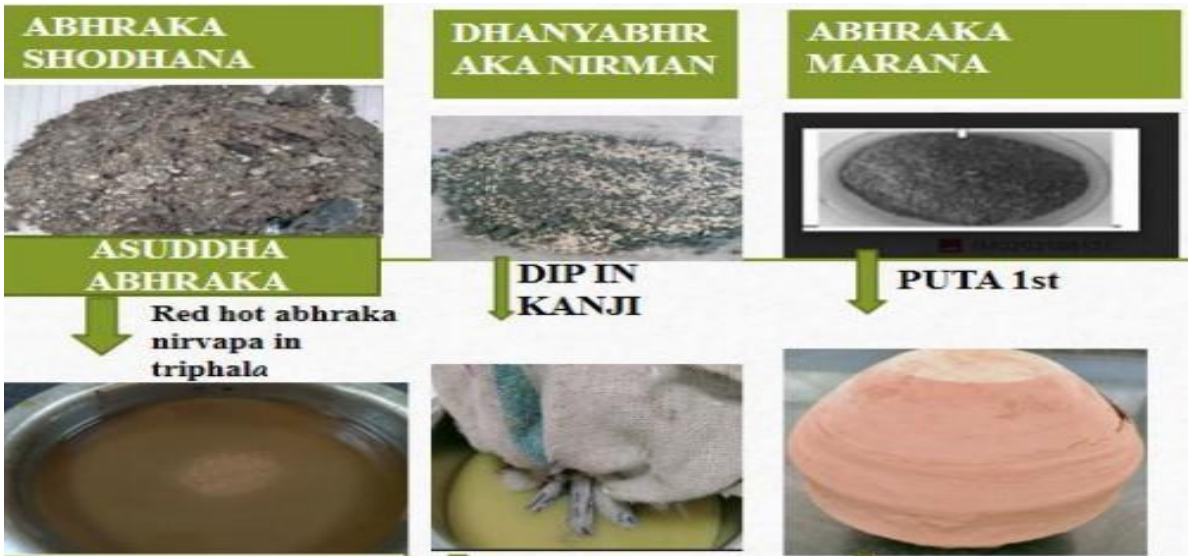
Table No. 12: Showing the values of various elements in ppm level (ICP OES) of Sample AB-1 and AB-2.

Sr.No.	Sample ID	Test Parameter	Testing method	Result mg/kg
1	AB-1	Mercury	In-House	Not Detected
		Cadmium	In-House	Not Detected
		Arsenic	In-House	Not Detected
		Lead	In-House	Not Detected
2	AB-2	Mercury	In-House	Not Detected
		Cadmium	In-House	Not Detected
		Arsenic	In-House	Not Detected
		Lead	In-House	Not Detected

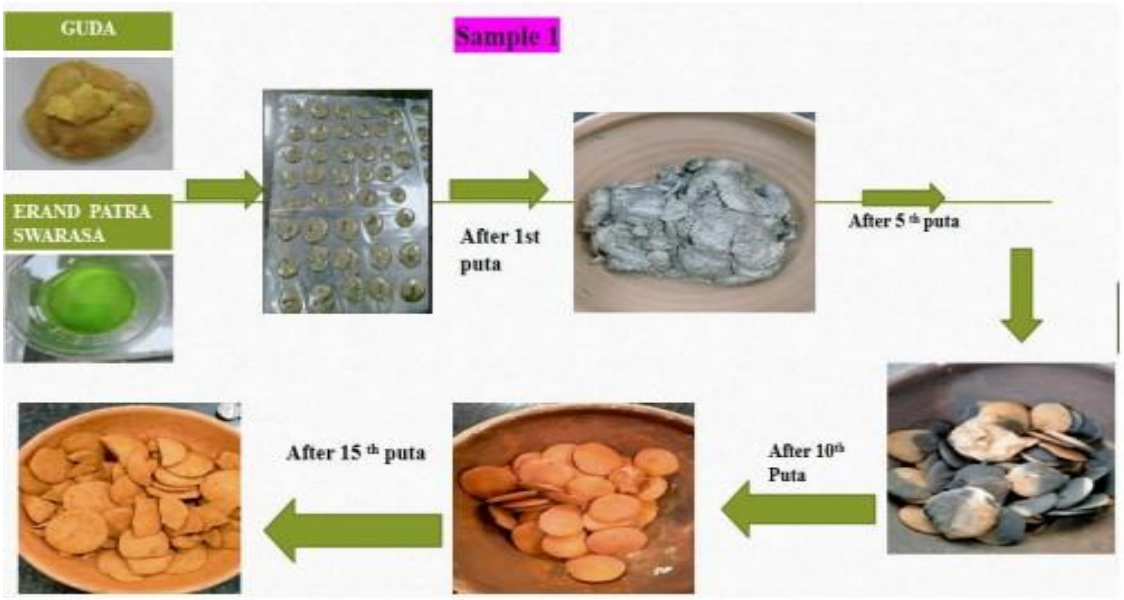
Table No. 13: Showing the Distribution of particles in Samples of *Abhraka Bhasma.*

Percentile	Particle size (AB-1)	Particle size (AB-2)
X10	1.45µm	1.41µm
X16	2.01µm	1.84µm
X50	6.57µm	4.65µm
X84	25.68µm	14.72µm
X90	36.54µm	21.27µm
X99	91.41µm	60.38µm
VMD	13.81µm	8.90µm
SMD	3.65µm	3.19µm

Pharmaceutical Images




TRIPHALA KAWATH
AFTER NIRVAPA
DHAYANABHRA KIKARANA
AFTER PUTA


GUDA
ERAND PATRA SWARASA
Sample 1
After 1st puta
After 5 th puta
After 10th Puta
After 15 th puta


Sample 2
Kasmarda swarasa
After 1 puta
After 15 puta
After 33 puta

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