



## Pharmaceutical Standardization

Study on *Bhasma Kalpana* with special reference to the preparation of *Kasisa Bhasma*Dhirajsingh Sumersingh Rajput<sup>1</sup>, G. S. Tekale<sup>2</sup>

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## Abstract

*Bhasma* means ash but according to *Ayurveda*, *Bhasma* means conversion of a metal into a form which is irreversible in the sense that one cannot derive the metal back from it again (*Apunarbhava*). It should be so light so that it must float on the surface of water after sprinkling, called *Varitara*. Its particle should be so small that it can enter in to the creases of fingers called *Rekha-purnatva*. The preparative procedure of *Bhasma* is a bit complicated. Many texts are available regarding the identification, acceptable qualities of metals and minerals, their purification, uses and method of preparation of their *Bhasma*. But in many texts, the method of *Bhasma* preparation of some metals and minerals is mentioned very briefly, i.e. their references are available in *Sutrarupa*. This leads to many practical difficulties in the preparation of *Bhasma*. *Kasisa Bhasma* is one of them. The present work was aimed to study the basic concept of *Bhasma Kalpana* by means preparing *Kasisa Bhasma*. This study suggests some modifications and ways for standardization of *Bhasma* procedure.

**Key words:** *Bhasma*, *Kasisa Bhasma*, *Marana*, standard operative procedure

## Introduction

“*Bhasma Kalpana*” is a special procedure of preparing Ayurvedic medicine from metals and minerals. It involves four basic steps such as selection of acceptable form of metal (*Grahya Rasa Dravya*), its purification by Ayurvedic method (*Shodhana*), levigation (*Bhavana*) and generation (*Maran* or *Putra*). Out of these, the first three steps remain valid today, but the last step, i.e. *Maran* or *Putra* needs to be modified. Because the material mentioned for *Maran*, i.e. *Putra* and cow dung cakes, varies from place to place. The other drawback about *Putra* is that in the *Rasa Grantha*, only the size of pit and number of cow dung cakes for *Putra* are mentioned but the quantity of metal to be incinerated in the respective *Putra* is not described. Along with this, during the preparative method of many *Bhasmas*, it is observed that there is a need to slightly modify the concept of *Putra* to evaluate the preparative method of some *Bhasma*, and to accept some modern technological help. Therefore, *Kasisa Bhasma* was selected for study as the preparative procedure of *Kasisa Bhasma* is described very briefly in some of the most valuable *Rasa Granthas* including *Rasa Tarangini*<sup>[1]</sup> *Rasa*

*Ratna Samuchchaya*<sup>[3]</sup> and *Ayurveda Prakasha*.<sup>[6]</sup>

In the present study, emphasis has been given on the number and weight of cow dung cakes, respective temperature, quantity of *Kasisa* in each *Sharava*, the duration of constant maximum temperature and size and number of *Sharava*.

## Aims and objectives

1. To prepare *Kasisa Bhasma*.
2. To find a direction for modification in the preparative procedure of *Bhasma*.

## Place of study

Department of Rasashastra and Bhaishajya Kalpana, Government Ayurveda College, Nanded.

## Materials and Methods

Selection of *Grahya Kasisa*

There are two types of *Kasisa*:

चूर्णकासीसश्चैव पुष्पकासीसकन्तथा ।  
कासीसं द्विविधं ख्यात रसतंत्रपणेत्तुभि ॥

कासीसं बालुकाद्येक पुष्प पुर्वमथापरम् ।

र. त. २१/२२८

र. र. स. ३/५१

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*Valuka Kasisa* is like sand, with greenish and slight yellowish color, while the *Pushpa Kasisa* is in small crystalline form with bright green color. According to the reference, the *Pushpa Kasisa* is of *Grahya* type and used for medicinal purpose. Hence, *Pushpa Kasisa* is selected to prepare *Kasisa Bhasma*. 1500 g of raw *Pushpa Kasisa* was purchased from Nagpur.

## Purification of *Kasisa*

### Material

Raw *Pushpa Kasisa*: 1500 g

*Bhringaraja Swarasa*: 8 l (*Swaras* was extracted from fresh *Bhringaraja* which was collected from Barad Herbarium of G.A.C., Nanded).

### Method

कासीसं भृङ्गराजोत्थवारीणी घटिकात्रयम् ।

सकृत स्विन्नं प्रयेत्लेन शुद्धिमायात्यनूत्तमामह ॥

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Purification of *Kasisa* was done by 3 hours *Swedan* in *Bhringaraj Swarasa* for 3 hours. Similar method is also described in *Ayurveda Prakasha*.<sup>[6]</sup> Its physical properties are as follows. *Kasisa* is partially soluble in water and the solubility increases with increase in temperature of water. At 80–90°C, *Kasisa* gets completely dissolved in water. Hence, after complete *Swedana* when *Kasisapottali* was removed, it was observed that *Kasisa* was completely dissolved in *Bhringaraja Swarasa* and only small quantity of sand remained in *pottali*. No reference is available about the method to obtain the dissolved *Kasisa* back into its crystalline form. This situation seems to be similar to the purification of *Shilajita*, therefore the methods of *Suryatapi* and *Agnitapi Shilajit* were considered and applied to the dissolved *Kasisa*. The dissolved *Kasisa* allowed to remain in the steel container for 24 hours. After this period, some *Kasisa* accumulated at the bottom, which was collected and allowed to dry in a steel tray under sunlight. Remaining *Bhringaraja Swarasa* was heated and vaporized to half of its level. Then, it was kept in separate steel tray and allowed to dry under sunlight. After 4 days, *Kasisa* in its crystalline form was obtained which measured about 1310 g, with 190 g loss.

## *Kasisa Marana*

### Material

*Shodhita Kasisa*: 300 g in each batch (total four batches).

*Bhavanadravya*: *Kanji* 3 l (for 1<sup>st</sup> 7 *Bhavana*)

### Method

Out of total 1310 g of purified *Kasisa*, only 1200 g was taken to prepare *Bhasma*. For this purpose, reference from *Rasa Tarangini*<sup>[1]</sup> was selected. Firstly, seven times *Bhavana* to purified *Kasisa* with *Kanji* was done and small cakes of nearly 4–5 cm in diameter and 0.3–0.4 cm in thickness were prepared and allowed to dry. 150 g of dried cakes taken in each *Sharava*. Eight such *Sharavas* were prepared and careful *Sandhibandhana* was done. These *Sharavas* were divided into four groups to study the temperature variability occurring due to the use of cow dung cakes.

In *Rasa Tarangini*, *Kukkutaputa* is advised for *Kasisa Bhasma*. Size of *Kukkutaputa* should be equal to the size of cock, i.e. 35–45 cm in height and width, but the reference about the number of cow dung cakes is not available. In *Yoga-Ratnakara*,<sup>[8]</sup> during *Suvarnamaran*, only five cow dung cakes are used as

*Kukkutaputa*. In *Rasa Tarangini*, *Rasa Ratna Samuchchay* and *Ayurved Prakash*, only the size of *Kukkutaputa* is given. The number of cow dung cakes, temperature of *Putra*, quantity of metal in *Sharava* and number of the *Sharava* are interrelated with each other. Therefore, on the basis of past experience, we knew that 20 cow dung cakes will give up to 650°C temperature and are sufficient to close two *Sharavas* from all sides.

All *Sharavas* must be closed by cow dung cakes to get equal temperature from all the sides. Hence, it was decided to give a *Kukkutaputa* of 20 cow dung cakes for two *Sharavas* containing 150 g *Kasisa* in each. Similar *Putra* were given to other three groups. Temperature was recorded continuously by pyrometer [Figure 1].

According to the reference from *Rasa Tarangini*, after the first *Putra*, lavigation of *Kasisa* was done in *Nimbu Swarasa* (extract of *Citrus acida*) instead of *Kanji*.<sup>[4]</sup> Similar procedure was repeated again for three times for each group. After each *Putra*, the obtained *Bhasma* was tested for no sourness (*Niramlatva*) which is the main test for *Kasisa Bhasma*.

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## *Bhasma Pariksha*

After four *putra* for each group, completely sourless *Kasisa Bhasma* was obtained. The obtained *Bhasma* was tested for *Varitara*, *Apunarbhava*, *Niruttha*, *Rekha-purnatva* [Figure 2], *Dantagre-kachkachabhava* and Atomic Absorption Spectroscopy for the elemental assay of Fe in *Kasisa Bhasma*, X-Ray Diffraction, total ash, acid-soluble ash, acid-insoluble ash, moisture content, organoleptic characters, water-insoluble and water-soluble ash.

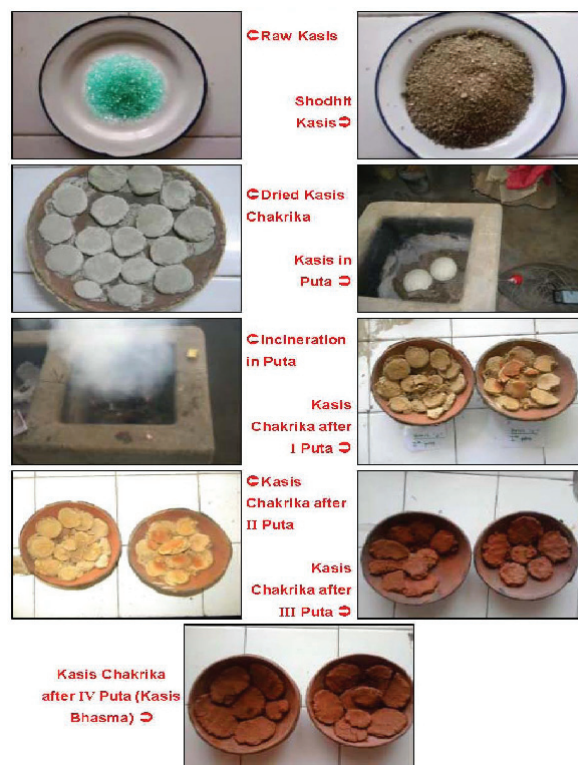


Figure 1: Preparation of *Kasisa Bhasma*



Figure 2: Bhasma Pariksha

## Results and Observations

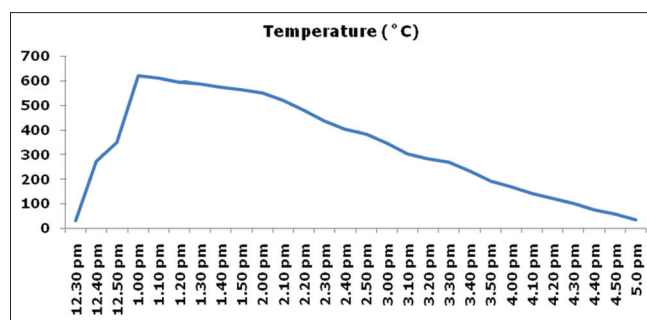
From the above observations, it becomes clear that, though the number of cow dung cakes is constant, the temperature and duration of peak constant temperature will vary with variation in weight of the cow dungs taken.

## Discussion

In the present study, 1500 g raw *Kasisa* was taken for the preparation of *Kasisa Bhasma*, out of which 1200 g was taken after purification for the *Marana* procedure. For *Kasisa* purification, totally 81 of fresh *Bhringaraj swarasa* was required for 3-hour *Swedana* in *Dolayantra*.

*Kanji* was prepared as per the reference mentioned in *Rasendra Chintamani* and seven times levigation was done for each batch separately. Then, *Nimbu Swarasa* was used instead of *Kanji* as mentioned in *Rasa Tarangini*. The cakes were prepared as uniform as possible in their size and shape, i.e. 4–5 cm in diameter and 0.3–0.4 cm in thickness. This is done to facilitate exact *Paka* (heating) and to observe the color changes in cakes. The size and shape of *Sharava* were also taken into consideration. All the *Sharavas* used were 19 cm in diameter, round shaped, and have a depth of 9 cm and average thickness 0.5 cm. As the *Sharavas* are low conductors of heat, their thickness affects the inner temperature in between *Sharavsamputa*. Similarly, the diameter of *Sharava* is related with the number of cow dung cakes and quantity of *Bhasma*. If the *Sharava* taken is big, then it requires more cow dung cakes to be completely closed from all the sides, and if the *Sharava* is small, it will not be able to accommodate all *Chakrikas*.

Detailed observations of each *Putra* was done for color changes in cakes, sourness of *Kasisa*, weight of *Kasisa* before and after *Putra*, number of required cow dung cakes and maximum temperature. The temperature was recorded by pyrometer. The duration of maximum constant temperature was also noted as it is the most important factor that affects the quality of *Bhasma*. If the maximum temperature remains constant for a long time, then the formed *Bhasma* will be *Khara-paka* (more heated). Typical pattern of temperature for *Kukkuta Putra* is shown in Graph 1. During *Putra*, it is found that when the weight of cow dung cakes is increased, then the maximum temperature and its duration also increases which is shown in I *Putra* of “B” batch and II *Putra* of “C” and “D” batch. *Kasisa* were tested for sourness. It was



Graph 1: Typical pattern of temperature during *putra*

observed that batch “B” was sourless after III *Putra*, while the other batches were not. This may be due to the exact *paka* of *Kasisa*. The IV *Putra* was given to batch “B” in spite of sourless taste because it did not completely pass the other tests, i.e. *Rekha-Purnatva* and *Dantagre-Kachkachabhav*. After four *Putra*, all the batches passed all *Bhasma Parikshas* [Table 1].

After 1<sup>st</sup> *Putra*, while levigating with *Nimbu Swarasa*, *Kasisa* was sticked to *Khalva Yantra*, which resulted in 64.5% loss. [Table 2]. The obtained *kasisa Bhasma* of all four batches passes similar organoleptic characters i.e. colour, odour, luster, taste and touch [Table 3]. *Apunarbhava* and *Niruttha* are related with heat stability of the *Bhasma*. Same result was obtained in *Apunarbhava* test [Table 4] but in *Niruttha* test slight difference was observed in weight after incineration with silver which is due to sticky nature of *kasisa Bhasma* [Table 5]. Moisture content of *Kasisa Bhasma* was measured with the help of Metler-Toledo moisture analyzer. If the *Bhasma* contains more percentage of moisture, then it does not pass the *Varitara Pariksha*. The percent moisture content of batch A, B, C and D is 0.62, 0.68, 0.58 and 0.62 respectively, which shows no significant difference [Table 6]. In Atomic Absorption Spectroscopy nearly same percentages of ferrous was observed [Tables 7]. The parameters were also produced no significant changes [Table 8].

X-ray diffraction was done by using the standard data JCPDS – KDD. In this the relative intensities and their corresponding  $a < d$  values are to be tallied with standard values of compounds. In present study, Analysis of four batches of *Kasisa Bhasma* was done by powder crystal method, as shown in the results of XRD. Prepared *Kasisa Bhasma* may be having complex chemical structure. In XRD studies peaks of many compounds remain unidentified, only sharp peaks denotes crystalline structure. It requires further more studies [Graphs 2a to 2d].

This study has some limitations, e.g. the quality of cow dung cakes varies from place to place. The effect of *Bhavana Dravya*, trituration frequency, time and applied pressure for trituration are not mentioned in this study because it a separate topic for research. However, this study will help in the preparation of *Kasisa Bhasma* in detail and will give direction for standardization of *Kasisa Bhasma*.

## Conclusions

1. The purification method of *Kasisa* mentioned in *Rasa Ratna Samuchchaya* (5/54) is suitable for only artificially prepared *Kasisa*.

Table 1: Detailed observation of *Putra*

No. of <i>Putra</i>	Group	Color of <i>Kasisa</i> cakes		Sourness		Weight of <i>Kasisa</i> (g)		No. of <i>Sharava</i>	Cow dung cakes used	Weight of cow dung cakes (g)	Maximum temperature (°C)	Constant temp. for minutes
		B.P.	A.P.	B.P.	A.P.	B.P.	A.P.					
I	A	D.G.	W.R.	+++	++	300	185	2	20	3200	580	2
	B	D.G.	W.R.	+++	++	300	182	2	20	3419	713	5
	C	D.G.	W.R.	+++	++	300	190	2	20	3240	610	3
	D	D.G.	W.R.	+++	++	300	179	2	20	3260	640	3
II	A	W.R.	Red	++	+	185	150	2	20	3225	624	3
	B	W.R.	Red	++	+	182	146	2	20	3270	660	3
	C	W.R.	Red	++	+	190	155	2	20	3408	704	4
	D	W.R.	Red	++	+	179	151	2	20	3352	690	4
III	A	Red	D.R.	+	+	150	132	2	20	3190	572	2
	B	Red	D.R.	+	-	146	120	2	20	3340	678	3
	C	Red	D.R.	+	+	155	128	2	20	3287	619	3
	D	Red	D.R.	+	+	151	127	2	20	3312	682	4
IV	A	D.R.	D.R.	+	-	132	119	2	20	3227	600	2
	B	D.R.	D.R.	-	-	120	95	2	20	3314	668	4
	C	D.R.	D.R.	+	-	128	110	2	20	3360	686	4
	D	D.R.	D.R.	+	-	127	102	2	20	3346	674	4

D.G. - Dark green, W.R. - Whitish red, D.R. - Dark red, B.P. - Before *puta*, A.P. - After *puta*Table 2: Loss of *Kasisa* during *Bhasma* preparation

	Raw	Purified	Putra								Obtained Kasisa Bhasma (g)
	Kasisa	Kasisa	I		II		III		IV		
	(g)	(g)	B.P. (g)	A.P. (g)	B.P. (g)	A.P. (g)	B.P. (g)	A.P. (g)	B.P. (g)	A.P. (g)	
Wt. of Kasisa (g)	1500	1310	1200	736	736	602	602	507	507	426	426
Loss	190		464		134		95		81		=774
Loss (%)	15.83		38.66		18.20		15.78		15.97		=64.5%

B.P. - Before *puta*, A.P. - After *puta*Table 3: Organoleptic characters of *Kasisa Bhasma*

Character	Batch A	Batch B	Batch C	Batch D
Color	Dark red	Dark red	Red	Red
Luster	No	No	No	No
Odor	Not specific	Not specific	Not specific	Not specific
Taste	Not sour	Not sour	Not sour	Not sour
Touch	Smooth	Smooth	Smooth	Smooth

Table 4: *Apunarbhava Pariksha* of *Kasisa Bhasma*

Batch	Reading no.	Weight of <i>Kasisa Bhasma</i> (g)	Weight of <i>Mitra- panchaka</i> (g)		Color of end product	Regain of <i>Dhatu</i>
			Before <i>Putra</i>	After <i>Putra</i>		
A	1	5	5	5.15	Black	No
	2	5	5	5.18	Black	No
B	1	5	5	5.12	Black	No
	2	5	5	5.12	Black	No
C	1	5	5	5.15	Black	No
	2	5	5	5.17	Black	No
D	1	5	5	5.14	Black	No
	2	5	5	5.13	Black	No

Table 5: *Niruttha Pariksha* of *Kasisa Bhasma*

Batch	Reading no.	Weight of <i>Kasisa Bhasma</i> (g)	Weight of silver (g)		Weight gain of silver (g)	Percent weight gain
			Before	After		
			<i>Putra</i>	<i>Putra</i>		
A	1	5	5	5.9	0.9	18.0
	2	5	5	5.9	0.9	18.0
B	1	5	5	5.86	0.86	17.2
	2	5	5	5.91	0.91	18.2
C	1	5	5	5.88	0.88	17.6
	2	5	5	5.86	0.86	17.2
D	1	5	5	5.85	0.85	17.0
	2	5	5	5.87	0.87	17.4

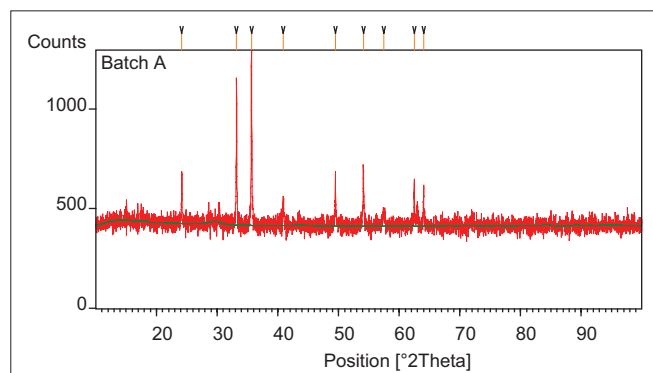
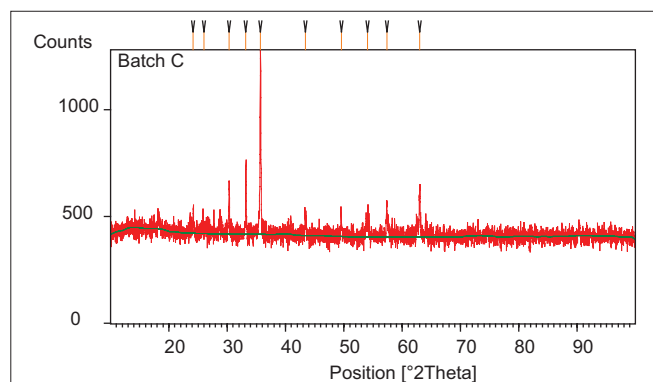
Table 6: Percent moisture content of *Kasisa Bhasma*

Batch	Percent moisture content
A	0.62
B	0.68
C	0.58
D	0.62

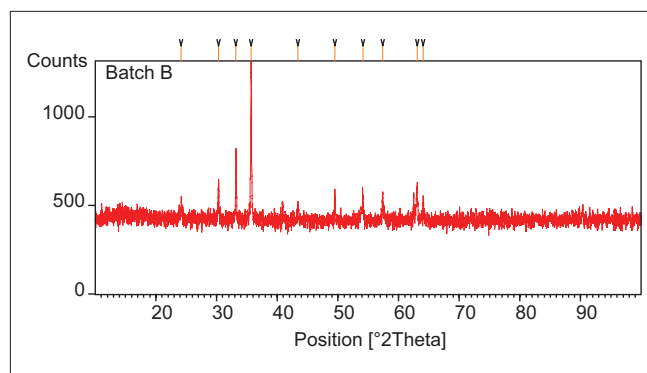
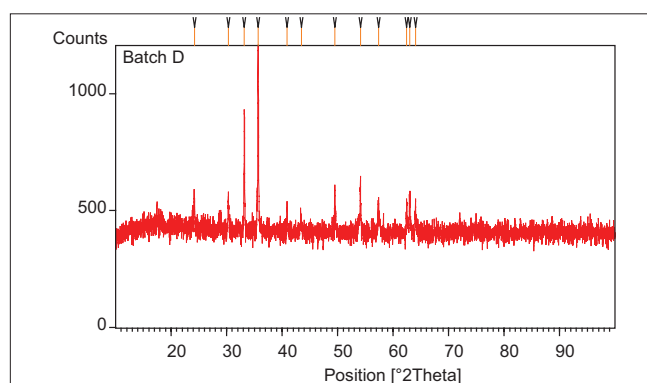


**Table 7: AAS for Fe of *Kasisa Bhasma***

Batch	Percentage of Fe
A	65.41
B	66.12
C	64.60
D	62.49

**Graph 2a: XRD report of batch A****Graph 2c: XRD report of batch C****Table 8: Ash value of *Kasisa Bhasma***

Parameter	Batch A	Batch B	Batch C	Batch D
Description	Red color	Red color	Red color	Red color
Total ash	92.93	93.40	85.85	90.19
Acid-soluble ash	26.95	28.13	24.43	27.62
Acid-insoluble ash	65.28	65.27	61.62	62.57
Water-soluble ash	92.65	93.19	85.58	89.95
Water-insoluble ash	0.28	0.21	0.29	0.26

**Graph 2b: XRD report of batch B****Graph 2d: XRD Report of batch D**

- The common purification method for both artificial and natural *Kasisa* is given in *Rasa Tarangini* (21/230) and *Ayurveda Prakasha* (2/275).
- Maximum temperature for 300 g *Kasisa* which was placed in two *Sharava* and incinerated by 3200 g cow dung cakes was 650°C, which remains constant for 3 minutes and four such *Putra* may be sufficient to produce sourless *Kasisa Bhasma*.
- Factors closely related with *Putra* procedure and that help in the modification of *Putra* are:
  - quantity of material (*Rasa Dravya*);
  - Bhavana Dravya*;
  - number and size of *Sharava*;
  - weight of cow dung cakes;
  - expected range of temperature; and
  - duration of constant maximum temperature.
- Total weight of cow dung cakes, quality of cow dung cakes, time required to reach the maximum temperature and duration of constant maximum temperature can be considered as the parameters for *Bhasma* preparation.
- During *Bhasma* preparation, heating must be started from

a temperature lower than the required temperature and is gradually increased after each *Putra*, which helps to create perfect *Paka* of *Rasa Dravya*.

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## हिन्दी सारांश

# कासीस भस्म निर्माण – एक अध्ययन

धीरजसिंह सुमेरसिंह राजपूत, जी. एस्. टेकाले

आयुर्वेद रसग्रन्थों में कासीस भस्म निर्माण अत्यंत संक्षिप्त रूप में वर्णित है। प्रस्तुत अध्ययन में कासीस भस्म निर्माण विधि का विस्तृत रूप से विवेचन किया गया है। साथ ही भस्म निर्माण के महत्वपूर्ण सिद्धान्तों का यथासंभव विवेचन किया गया है। यथा शोधन, भावना, पुट आदि विषयों पर प्रकाश डाला गया है। यह अध्ययन विशेष रूप से कासीस निर्माण के साथ-साथ भस्म कल्पना के मानदंड में कुछ नवीनतम तथा आधुनिक विधियों के सुझाव के लिए किया गया है। जिसका वर्णन निष्कर्ष के अंतर्गत प्रस्तुत किया है। भस्म निर्माणार्थ दिये जानेवाले पुटों के मूल स्वरूप को बनाये रखते हुये उनमें आधुनिक दृष्टिकोण से कुछ परिवर्तनों की आवश्यकता तथा उपादेयता का विचार इस अध्ययन की प्रमुख विशेषता है।