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A Pharmaceutico-Analytical Study of *Bhunaga Satva*

Dr. Manish Kumar Patel,¹ Dr. Archana,² Dr. Lalchand,³ Dr. Saroj Parhate⁴

¹Ph.D. Scholar, Dept. of Rasa Shastra and Bhaishajya Kalpana, Gopabandhu Govt. Ayurved Medical College, Puri, Orisha, ²M.D. Scholar, Dept. of Rasashastra and Bhaishajya Kalpana, ³M.D.Scholar, Dept. of Dravyaguna, ⁴Professor and H.O.D., P.G. Dept. of Rasashastra and Bhaishajya Kalpana, Govt. Ayurved College, Raipur, Chhattisgarh, INDIA.

ABSTRACT

The knowledge of *Tamra* (copper) was known to Indians, since early ages of medical practice. It is having the *Rasayana*, emetic, purgative, blood purifying properties. *Ashodhita* Copper causes *Vanti* (vomiting) and *Bhranti* (mental illusion). So it should be used after *Shodhana* only. Various pharmaceutical procedures i.e. *Shodhana* (purification), *Marana* (incineration), *Satvapatana* (extraction of metal from mineral) etc. converts deadly toxic mineral, metallic substances into safe and potent therapeutic agent. *Bhunaga* (earthworm) *Satva* has been mentioned as a source of *Tamra* (copper). This paper aims to make available standard manufacturing process of *Bhunaga Satva-Patana*. *Satvapatana* process performed by method described in *Rasa Tarangini*. 2 gm of *Satva* was obtained from 120 gm of *Bhunaga Masi*. Percentage yield of *Satva* was 1%. The prepared *Satva*'s were subjected to qualitative and quantitative analysis. In *Bhunaga* there was *Satva* higher percent of Fe (75.3%) along with containing Cu 18.8% and Zn 2%.

Key words: *Bhunaga, Satva, Essence, Satvapatana.*

INTRODUCTION

Satvapatana is the most important and widely described topic in *Rasashastra*. *Satva* denotes "purity, literally, existence, reality and brightness". *Satvapatana* is an important process which applies after *Shodhana*. So various trace elements are added and molecular changes have been seen in the particular drug during the procedure of *Shodhana* to *Satvapatana*. To obtain the metallic part from the Minerals / Ores / Compounds with the help of

Dravaka Gana by strong heating in *Koshthi* (specially prepared fired place), here *Satvapatana* is smelting process.^[1] According to *Rasaratna Samucchya* any mineral compound, animal origin or any ore is mixed and rubbed with the drugs prescribed in *Kshara Varga*, *Amla Varga* and *Dravaka Varga*. Then it is kept in a closed crucible and heated intensively, in a *Koshti* (furnace). By this, the metallic essence portion of that compound can be obtained, which is nothing but *Satva*.^[2] After *Satvapatana* potency of these drugs remains for longer period. *Satva* requires minimal dose and easy for administration. More potent as compared to other preparations. *Abhraka Satva* form is eight time more potent than *Abhraka Patra* form.^[3] *Rasakalpas* containing copper is used in treatment of various diseases. Copper is said to be very harmful if it's *Shodhana* and *Marana* is not done properly.

Bhunaga is described under *Swarnadi Varga*, *Uprasa Varga* and most of *Rasa-Aacharyas* mentioned *Bhunaga* in *Tuttha* and *Tamra* section. Its origin is mentioned in rainy season in soil and it mainly occurs in *Swarna Bhumi*, *Rajat Bhumi*, *Lauha Bhumi* and

Address for correspondence:

Dr. Archana

M.D. Scholar, Dept. of Rasashastra and Bhaishajya Kalpana, Govt. Ayurved College, Raipur, Chhattisgarh, INDIA.

E-mail: archanakalihari1806@gmail.com

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Tamra Bhumi where in *Grahyatva* of *Bhunga* from *Rakta Bhumi / Tamra Bhumi* was subjected due to easily available and has much therapeutically and rich of copper. Therapeutic use of *Bhunaga* in existence is since *Samhita* period *Charaka Samhita* mentioned *Bhunaga* in *Shosha Chikitsa*, *Sushruta* and *Astanga Sangraha* have reference of *Gandupada* in *Yantra* chapter in relation to show shape of *Ganadupadamukhi Shalaka*. *Bhunaga* with its properties and *Satvapatana* method is firstly described in *Raja Nighantu*, since medieval period *Bhunaga* is used in various *Sanskar* of *Parada* and to make *Vajradravani Musha* and *Mudrika Niramanarth*. *Ayurveda Prakash* explained *Bhunaga* in brief with origin, synonyms, types, characteristics, *Bhunaga Satvapatana* along with its clinical importance and *Bhunaga Mudrika* and *Mantra Vidhi*. *Satvapatana* of *Bhunaga* is mentioned by various *Rasa-Aacharyas* but they have different opinion. For *Satvapatana Bhunaga* is subjected to take in various forms. *Bhunaga Satvapatna* was firstly introduced in *Rajanighantu* and *Rasaratanakar* the oldest classics of *Rasashastra* mentioned maximum six methods of *Bhunaga Satva-Patana*. Appearance and colour of *Bhunaga Satva* are explained in various *Rasagranthas* with different words considered as it is most of *Tamra* or *Abhravat Satva* and *Khara Satva*. There has reference of pharmaceutical properties of *Bhunagasatva* as well as therapeutical significance. In *Rasagranthas Bhunaga Satva* properties, incineration and *Satva Bhasma* properties are mentioned as same as of *Tamra*.

In *Satvapatana*, time of heating, number of heating amount of fuel and temperature is not mentioned by *Rasacharya* may be due to variations in drugs but to observe of *Satvapatna* some features are clearly mentioned which indicates sign of obtaining *Satva* i.e. *Bijavarta* and *Suddhavarta*. In this present study *Bhunaga* is subjected for *Mridu Satvapatana*. To evaluate the temperature in which *Bhunaga* gives the features of *Bijavarta* and *Shuddhavarta*, and to explore the temperature when obtain *Satva* from *Bhunaga*. In this study required amount of heat and fuel for *Mridu Satvapatana* as *Bhunaga Satvapatana*

have been evaluated. The prepared *Satva's* were subjected to qualitative and quantitative analysis.

AIMS AND OBJECTIVES

1. To prepare the *Satva* of *Bhunaga* by the *Nirmalakarara*, *Shodhana* and *Satvapatana* process according to *Rastarangini*.
2. To evaluate the temperature in which *Bhunaga* gives the features of *Bijavarta* and *Shuddhavarta*.
3. To explore the temperature when obtain *Satva* from *Bhunaga*.
4. To evaluate the amount of fuel needed for *Mridu Satvapatana* as *Tuttha Satvapatana*.
5. Qualitative and quantitative analysis of prepared *Bhunaga Satva*.

MATERIALS AND METHODS

Earthworm was procured from soil of Govt. Ayurveda College, Chhattisgarh through demand letter. Other allied materials lemon juice, raw *Tankana* were collected from the local market.

The whole pharmaceutical work can be divided into three steps;

1. *Bhunaga Jarana / Masi* formation
2. *Bhunaga Ball (Pinda/Vataka)* formation
3. *Bhunaga Satvapatana*

Prepared *Satva* was analyzed by employing various methods like organoleptic characters, Physio-Chemical parameters and X-Ray Diffraction (XRD) test in these parameters - Organoleptic Characters such as Colour, Odor, Taste, Touch, Loss on drying, Total ash, Acid insoluble ash, Water soluble ash, pH.

1. Bhunaga Jarana / Masi formation

Reference: A.P. 4/59^[4]

Procedure

3.6 kg of *Bhunaga* burnt in an iron pot and obtained black colour of smooth powder *Masi*, weighed was 600 gm this process is completed in 30 minutes process was done by using *Jarana* method [yield

16.7%] cause of weight loss of *Bhunaga* is due to animal origin and have very higher percent of water.

Fig.1: Bhunaga Jarana



Fig.2: Bhunaga ball formation



Observations

- During burning it had bad smell
- In start of burning procedure Bhunaga instantly dehydrated in this process.

2. Ball (*Pinda/Vataka*) formation

Reference: R.T. -17/117[5]

Procedure:

200gm of *Bhunagamasi* triturated with subjected *Satvapatana* drugs [jaggery, *Guggulu*, *Tankan*, sesamum oil cake, wool, dried small fishes] cautiously the mixture was subjected for continuous

trituration for 2 days [6 hour] obtained darkened black colour of smooth paste of mixture weight was 390gm [yielded 97.5%], process was done by using *Bhavana* and *Mardana* method ball made by the paste and completely dried for next 2 days.

Observations

- The colour of mixture gradually turned into dark black colour and at the end of process it became more darkened and black.
- After ending of trituration the paste became so smoother that it easily leaves stone mortar and pestle.

3. *Bhunaga Satvapatana*

Reference: R.T.17/118[6]

Procedure:

390gm of *Pinda* of *Bhunaga Masi* mixture kept in closed crucible, crucible and lid dish sealed by mud and clay after drying, this was kept in mid part of *Koshthi* between fuels for strong heating after liquefying of most part of ball (time taken 7.30 hour tem. 1620°C) where it stopped to melt crucible left for self-cooling (21hour) after this finished product was taken out, finished product was found deposited mostly at the bottom and very little in surrounding of crucible looked like ash and no any *Satva* like particle present so procedure was again repeated with above ash and finally found the finished product had crystalline like appearance which contains shiny particles weight of 110gm [yield 29%], grinding of finished product in stone mortar and pestle was done and shiny particles which had metallic appearance, weight was 2gm.

Observation

- Fumes came out through centre hole of lid dish.
- That fumes gradually decreased after 1 hr. of procedure.
- After 5 hr. red hot colour of crucible was observed.
- After 6.30 hr. red hot bluish flames were observed.

- At this time ball started melting blue flame increased (*Bijavarta*)
- After 1 hr. of *Bijavarta* ball mostly melt and stopped melting even in higher temperature.
- After first time of procedure cooled smelting material looked like *Masi* and no any *Satva* like particle present in it.
- After second time of procedure cooled Smelting material looked like glass/plastic some bright shiny particle immersed.
- Bright, shiny particle were round in appearance and heavy in nature.

Temperature recorded and observations made during *Bhunaga Satvapatana* is shown in Table 1.

Fig. 3 and 4: Procedure of *Bhunaga Satvapatana*

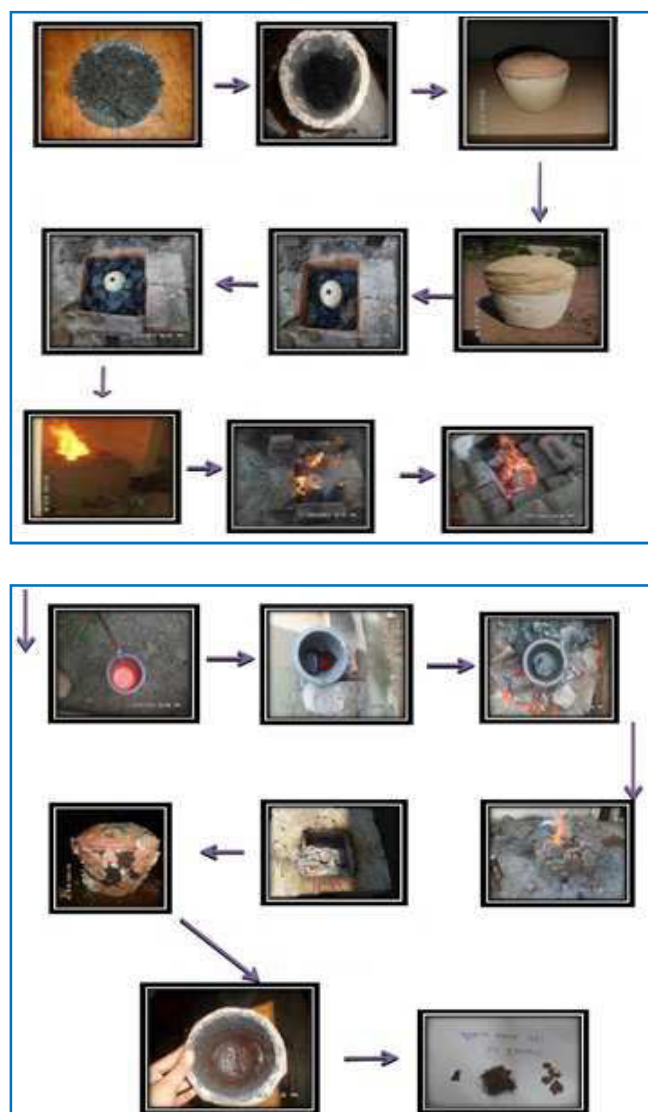


Table 1: Temperature recorded and observations made during *Bhunaga Satvapatana*

Time	Temp.	Observations
9.00am	30°C	Heating started.
9:30	800°C	Mixture was dry and in ball form.
10:00	850°C	Mixture was dry and blackish fumes started coming out.
10:30	900°C	Mixture was dry and fumes started coming out.
11:00	940°C	Blackish fumes gradually decreased and stop to come out.
11:30	1150°C	Mixture was dry
12:00	1200°C	Mixture was dry.
12:30	1300°C	Mixture became semi-liquid state
1:00	1340°C	Mixture still in semi-liquid state
1:30	1380°C	Mixture still in semi-liquid state.
2:00	1400°C	Red hot of crucible observed
2:30	1400°C	Blue flame appears.
3:00	1420°C	Blue flame appears.
3:30	1440°C	Smelting of mixture started and blue flame increased (<i>Bijavarata</i>). Removal of crucible and <i>Abhisheka samskara</i> done crucible again kept in <i>Koshthi</i>
4:00	1580°C	White flames appeared
4:30	1620°C	White flame increased (<i>Shuddhavarta</i>) and ball mostly melt, here ball stop melting.
5:00	1400°C	Decrease of temperature.
5:30	1200°C	Decrease of temperature.
6:00	930°C	Decrease of temperature.

6:30	750°C	Decrease of temperature.
7:00	700°C	Decrease of temperature.
7:30	700°C	Left for self-cooling.

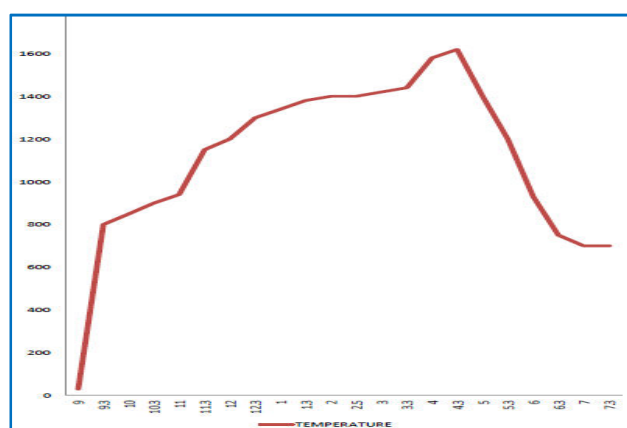


Fig. 5: Graphical presentation of temperature pattern in *Bhunaga Satvapatana*

OBSERVATIONS AND RESULTS

Organoleptic characters

The organoleptic character was assessed for *Satva*, the appearance of *Satva* in metal form [bright, shiny and metallic lusture]. As per classic the *Satva* of *Bhunaga* denoted *Astamramayamandtamasavatam*. *Bhunagasatva* grayish brown in colour was observed. *Satva* is having metallic taste, touch was hard and odorless.

Satvapatana procedure

1. At 1440°C smelting of mixture started and blue flame appeared i.e. Bijavarta.
2. At 1620°C mixture mostly melt and now stop to melt and white flame increased i.e. Shuddhavarta.
3. After self cooling (21 hour) Smelting material was obtained at bottom of crucible which was strongly adhered in bottom and surrounding of crucible.
4. After cooling smelting material have crystalline (glass or plastic crystals) like appearance which contains shiny particle *Satva* in immersed condition.

5. *Satva* obtained in one attempt. *Satva* was Metallic (Bright; shiny and metallic lusture) and Greyish brown in color.
6. Total 200 gm of *Bhunaga Masi* was taken and obtained quantity of *Satva* was 2 gm. Percentage yield of *Satva* was 1%.

Table 2: Physico-chemical analysis of raw material

SN	Characteristics	<i>Bhunaga Masi</i>
1.	Loss on drying	7%
2.	Total ash	73.06%
3.	Acid insoluble ash	61.96%
4.	Water soluble ash	35.03%
5.	pH value	1.88%

Table 3: Organoleptic characters of *Satva*

Organoleptic character	<i>Bhunaga Satva</i>
Appearance	Metallic (Bright; shiny and metallic lusture)
Colour	Greyish brown
Touch	Hard
Odour	-
Taste	Metallic

Table 4: Total fuel quantity used for *Bhunaga Satvapatana*

Types of fuel	Quantity used in <i>Bhunaga Satvapatana</i>
Mine Coal	38 Kg
Cow dung	8 Kg
Wood Coal	8 Kg
Wood	4 Kg
Total quantity	58 Kg

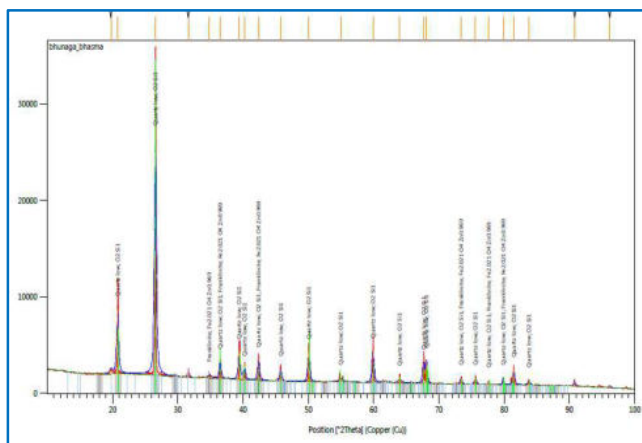


Fig. 6: XRD analysis of Bhunaga Satva

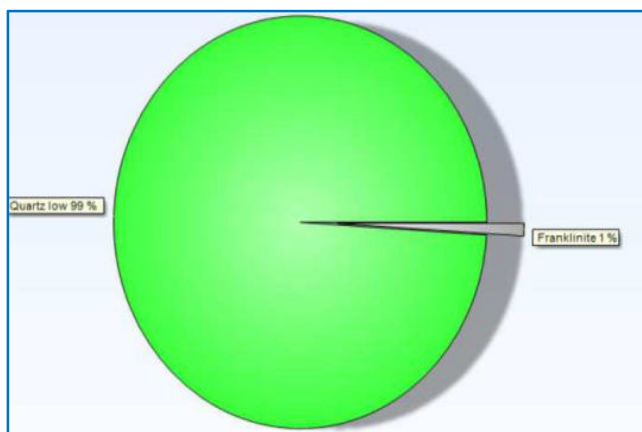


Fig.7: Result of XRD analysis of Bhunaga Satva

Table 5: Quantitative analysis of Satvas by XRD results

Satva	cu [pure and compound]	Fe	Zn	Mn ₂ O ₃	Si
Bhunaga Satva	18.8%	75.3% (Fe - 72.3% Fe ₂ MnSi - 3%)	2% (Zn with Cu)	4%	---

DISCUSSION

Appearance of essence~Satva same as per mentioned in different classics. In different text of *Rasashastra*, *Andha Musha* (Blind crucible) is mentioned for *Tuttha Satvapataan*. But due to formation of Sulphur dioxide blind crucible get blast. So in this study *Andha Musha* with a small hole in the center of lid dish was taken, which facilitate - (a) Observation of smelting process

(b) Allow to Pass out of gases. In *Bhunagasatva* there is higher percent of Fe (75.3%) along with containing Cu and Zn (18.8% and 2% respectively). It may be due to interaction of *Satvapatana* drugs with *Bhunagamasi* during *Satvapatana* procedure. The present study shows that the above *Satva* contained Fe, Cu, Zn, Mn. as major component in various percent along with other trace elements in minor percent.

CONCLUSION

Bhunaga Satva obtained by 2 repeated attempt of *Satvapatana*. *Bhunaga Satva* denoted as *Tamravatam* or *Tamrarupam* in various *Rasa* classics. Metallic content percentage in raw sample and percentage of obtaining *Satva* are near about same in *Bhunaga Satva*. *Bhunaga Satva* contain Cu in various percentages. *Bhunaga Satva* have higher percentage of Fe (75.3%) with Zn (2%)and Cu (18.8%). These *Satvas* contained Fe, Cu, Zn, Mn. as major component in various percentit uses in deficiency of these metals. So probable mode of action in modern point of view, during Post-partum period due to excessive blood loss Hb% decreases, most chances of infection and pain also occurs due to loss of minerals and elements where Fe, Cu, Zn, Mn. supplements are given in various form. The main cause of Muscle pain, cramps and strain where above elements play an important role to prevent and cure these conditions, while in several kind of abdominal pain having enzymes deformities Cu, Fe, Zn and Mn. are useful for enzyme balance.

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