



CHEMICAL STANDARDISATION STUDIES ON VARATIKA BHASMA

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ABSTRACT

In the present work *Varatika Bhasma* prepared from *Varatika*, which comes under *Sadharana Rasavarga* and also under *Sudhavarga* as per Rasa literature, is taken up and studied from Standardisation point of view. *Varatika* is the external shell of sea animal *Cypraea moneta linn*. Chemically *Varatika* is identified as Carbonate of Calcium.

Varatika Bhasma was prepared as per standard classical methods. Chemically analysed at various stages of purification and the final product. Analyses were carried out employing sophisticated instrumentation techniques such as XRD, Particle Size, FTIR and SEM. Physico - chemical standards were determined for both the samples. The data of the results of the prepared sample are discussed in this paper.

Keywords:

INTRODUCTION

Bhasmas are unique formulations belonging to *Ayurveda* a leading and popular traditional Indian system of medicine. This group of medicines can work even in smaller doses and may even control incurable diseases effectively.

Bhasmas essentially contain minerals and metals as integral part of formulations and are used after adopting proper purification process employing various purifying agents. These detoxification processes remove the toxic potentials from minerals and metals and impart a very high grade therapeutic efficacy.

It is very clear and evident from long history of usage of herbomineral and metallic preparations in *Ayurveda* and *Siddha* medical system that properly processed herbomineral preparation can contribute significantly to the health care of the society. To understand the science involved in the purification processes a simple preparation *Varatika Bhasma* was selected and studied.

Varatika, is categorised under *Sadharana Rasavarga*¹ and also under *Sudhavarga* by Rasa scholars. *Varatika* is identified as the external shell of sea animal *Cypraea moneta linn*. It occurs in the coastal areas of the sea. *Cypraea moneta*, commonly known as the money cowry, because the shells were historically widely used in many Pacific and Indian Ocean countries as a form of exchange.

Chemically, *Varatika* is identified as Carbonate of Calcium². Since ancient days *Varatika* is used for playing as well as for medicinal purposes. *Dharana* (amulet) of *Varatika* is practiced for the treatment of *Balagraha* (viral infections of children).

In the present paper *Varatika Bhasma* whose main indications are in *Agnimandya* (Loss of appetite), *Parinamasula* (Duodenal ulcer), *Grahani* (Malabsorption syndrome), *Rajayakshma* (Tuberculosis), *Karnasrava* (Otorrhoea), *Netraroga* (Diseases of the eye) and *Sukraksaya* (Oligospermia) was prepared and studied from standardization point of view.

Grahya *Varatika* - Salient features of Acceptable variety:

The *Varatika* which is having yellowish tinge and has nodules on the back and oval in shape is praised as *varatika* or *caracara*³. This *Varatika* is often recommended in the preparation of *Varatika Bhasma*.

MATERIALS AND METHODS

Varatika (Cowrie shells) were procured from Rawdrug shop of Thanjavur market. The drug was purified as per the methods

mentioned in Standard Ayurvedic texts. Fresh *Kulatha* (Horse gram) was purchased from the market botanically identified as *Macrotyloma uniflorum* Lam belonging to the family Fabaceae and its *kashaya* (decoction) was prepared for the purification process. Fresh *Aloe vera* was collected and its juice was used for making *cakrikas* or pellets to be used in the incineration process of *Varatika*. Geochemical analyses were carried out as per the procedures given in The Textbook of Mineralogy. Chemical analysis were carried out employing modern sophisticated techniques such as FTIR, Particle size analyser, XRD and Scanning Electron Microscope (SEM).

Fig 1: Raw *Varatika - Cypraea Moneta*Ingredients of *Varatika Bhasma*:

1. Raw *Varatika*
2. *Kulatha kashaya* (Horse gram decoction for Purification)
3. *Kumari svarasa* (*Aloe vera* juice for grinding during incineration)

Dosage: 250 mg⁴

Anupana (Vehicle): *Vasa svarasa* (*Adhatoda vasica* juice), *nimbu svarasa* (lemon juice), *trikatu kashaya* (decoction prepared with equal quantity of *Piper longum*, *Piper nigrum* and *Zingiber officinale*).

Pharmacological Properties⁵**Rasa (Taste)** - *Katu* (Pungent)**Guna (Property)** - *Ushna* (Hot)**Virya (Potency)** - *Ushna* (Hot)**Vipaka (Post digestive effect)** - *Katu* (Pungent)

Karma (Action) – Agnidipana (increases appetite), Pachana (improves digestion), Vrishya (aphrodisiac), Netrya (Good for the eyes)

Preparation of Varatika Bhasma

A. Sodhana - Method of purification

Varatika is subjected to Svedana in *Dola yantra* with *kulatha kashaya* for 1 yama (3 hours) ⁶. The observations made during *sodhana* process are given in Table no – 1.

*Dola yantra*⁷ is an earthen vessel which has two holes at the opposite sides of its edge and filled with prescribed liquid. It has a rod inserted through these holes across the mouth of the vessel. The mineral substance undergoing the process of *svedana*, were tied in to *pottali* (bundle) and suspended with the help of a thread in to the liquid, so that it is completely immersed. The other end of the thread was tied to the rod. The pot is then kept on the stove and heated. This instrument is called *Dola yantra*. Here the liquid used was *kulatha kashaya* (Horse gram decoction).



Fig 2: *Macrotyloma uniflorum* Lam (Horse gram)



Fig 3: *Dola yantra* method of Purification



Fig 4: *Varatika* (before purification)



Fig 5: *Varatika* (after purification)

Table 1: Observations made during Sodhana process with *Kulatha kashaya*

Sample	Colour	Weight
Raw Drug	Yellowish white	500 gm
Purified	Grayish white	457 gm

Geochemical properties

The geochemical properties⁸ of raw and purified samples are given in Table No - 2.

Table 2: Geochemical properties

Sl no	Properties	Raw	Purified
1.	Chemical comp	CaCO ₃	CaCO ₃
2.	Colour	Yellowish white	Grayish white
3.	Habit	Amorphous	Amorphous
4.	Fracture	Conchoidal	Conchoidal
5.	Cleavage	Absent	Absent
6.	Nature	Hard	Brittle
7.	Hardness	3.5	3.5
8.	Streak	White	White
9.	Lustre	Pearly lusture	Pearly lusture
10.	Magnetic properties	Non magnetic	Non magnetic
11.	Electric properties	Non conductor	Non conductor

B. Method of Marana - Incineration

The *kulatha kashaya* treated *Varatika* was directly placed in *sarava samputa* (earthen plate), sealed with another earthen plate and dried. After drying it was subjected to *Gajaputa* and the *sarava samputa* was collected after cooling. *Gajaputa*⁹ means a pit which measures one *Rajahastha* (about 30") in length, width and depth was made and cow dung cakes are filled up to brim of this pit. Then properly sealed *sarava samputa* containing mineral drugs was placed upon the heap of the cow dung cakes and half the number of cow dung cakes were spread upon the *sarava samputa* and the fire was lit. The *Varatika* which became brittle were collected and powdered. The powdered *Varatika* is given *bhavana* (trituration) with 400 ml of *kumari svarasa* (*Aloe vera* juice) for 4 hours. Then *Cakrikas* (pellets) were prepared and dried. After drying these pellets were subjected to second *puta*. The process was repeated for three times. Third time, 300 ml of *Kumari svarasa* was used and it was ground for 3 hours. After cooling white coloured *Varatika Bhasma* was obtained¹⁰. Here *bhavana* refers to the process of grinding the mineral drugs in the liquids like juices or decoction of herbs, cow's milk, urines or any such specified liquids. The quantity of liquid should be sufficient to immerse the mineral powder. The grinding was continued, until liquid added dried up and semisolid consistency was achieved. This makes on *bhavana* and the same process was repeated. Observations made during *Marana* (incineration) process are shown in Table No – 3.

Table 3: Observations made during Marana (Incineration) process

Putra	Quantity Svarasa used	ofHours grinding	ofWeight putra	after
First	-	-	441 gm	
Second	400 ml	4 hrs	288.6 gm	
Third	300 ml	3 hrs	226 gm	

**Fig 6: Varatika Bhasma (Final product)****RESULTS****Chemical analysis of initial and final product**

The Chemical Analysis of Initial and Final product is shown in Table No - 4 & 5.

Organoleptic properties

Colour: Dull White Fine Powder

Odour: Odourless

Taste: Tasteless

Solubility: Soluble in Dilute Hcl

The physico chemical analysis showed Loss on drying - 0.6566 %, pH - 10.30, Total ash - 96.5290 %, Water soluble Ash - 3.8001 and Acid insoluble ash - 1.2779. The parameters selected and studied

proved that the Bhasma prepared is of good quality fullfilling the standard parameters required.

Table 4: Inorganic constituents

Sl. No	Name of the parameter	Raw Varatika	Varatika bhasma
1.	Ash (%)	4.13	2.06
2.	Organic Carbon (%)	0.52	1.09
3.	Total Nitrogen (%)	0.56	0.72
4.	Total Phosphorus (%)	0.36	0.62
5.	Total Potassium (%)	3.26	3.49
6.	Total Sodium (%)	1.06	1.36
7.	Total Calcium (%)	15.63	19.32
8.	Total Magnesium (%)	8.56	8.43
9.	Total Sulphur (%)	0.78	0.94
10.	Total Zinc (ppm)	1.56	1.48
11.	Total Copper (ppm)	0.52	0.42
12.	Total Iron (ppm)	102.0	113.6
13.	Total Manganese (ppm)	17.56	19.62
14.	Total Boron (ppm)	0.08	0.06
15.	Total Molybdenum (ppm)	0.02	0.03

Table 5: Organic constituents

Sl. No	Name of the parameter	Raw Varatika	Varatika bhasma
1.	Total Alkaloids (mg kg ⁻¹)	0.03	0.05
2.	Total Flavonoids (mg kg ⁻¹)	0.23	0.21
3.	Tanin (mg kg ⁻¹)	0.22	0.19
4.	Lignin (mg kg ⁻¹)	0.03	0.04
5.	Glycosides (mg kg ⁻¹)	0.08	0.05
6.	Serpentines (mg kg ⁻¹)	Nil	Nil

Physico chemical evaluation

The Physico chemical evaluation of Varatika Bhasma is given in Table No - 6.

Table 6: Physicochemical evaluation of Varatika bhasma

Sample name	Colour	Odour	Taste	Solubility	PH (1% solution)	Loss on drying (%)	Total ash (%)	Water soluble ash (%)	Acid insoluble ash (%)
Varatika bhasma	Dull white fine powder	Odourless	Tasteless	Soluble in dilute Hcl	10.30	0.6566	96.5290	3.8001	1.2779

Table 7: Preliminary phytochemical screening

Sl.No	Reagents	Reaction	Results			
			Raw	After purification	After first puta	Final product
1	Water shake	Foamy Lather	-	-	-	-
2	Picric acid	Yellow	+	+	+	+
3	Lead Acetate Solution	White precipitate	+	+	+	+
4	Acetic anhydride + Sulphuric acid	Dark green colour	-	-	-	-
5	Tin + Thionyl Chloride	Pink colour	-	-	-	-
6	Anthrone + Sulphuric acid	Green colour	+	-	-	-
7	Mg Bits + Hcl	Magenta colour	-	-	-	-
8	10% NaoH	Yellow colour	-	-	-	-
9	Conc.H2SO4	Red colour	-	-	-	-
10	Alcoholic Solution of phloroglucinol + Hcl	Pink colour	+	-	-	-
11	Dragendroff's Reagent	Reddish brown colour precipitate	-	-	-	-

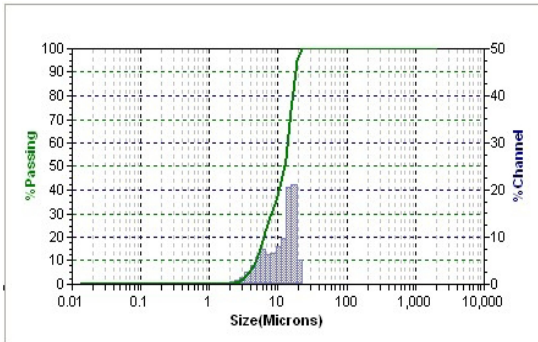


Fig: 7 Particle size analysis of raw *Varatika*

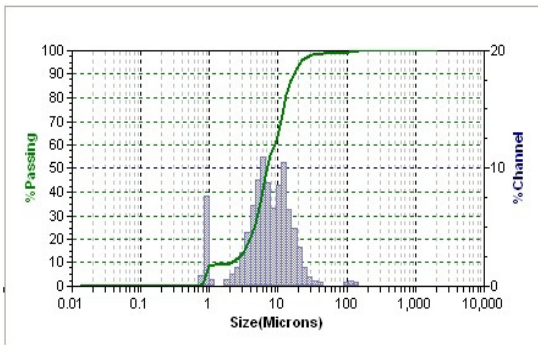


Fig: 8 Particle size analysis of *Varatika bhasma*

The average Particle size of Raw *Varatika* (Cowrie shell) is 11.62+/-5.56 and the average Particle size of final product (after putam)-9.69+/- 5.31.

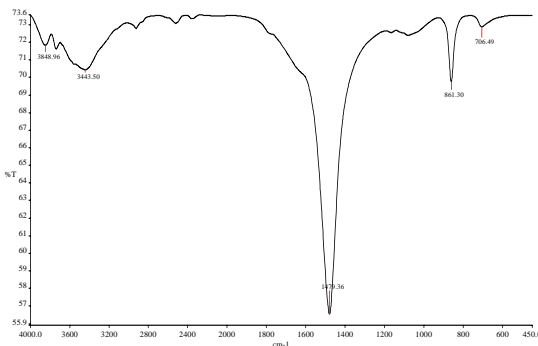


Fig: 9 FTIR spectrum of raw *Varatika* (Cowrie shell)

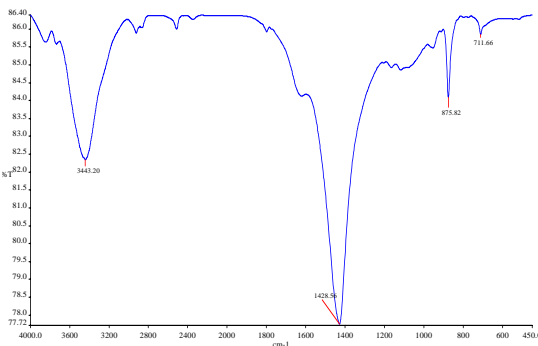
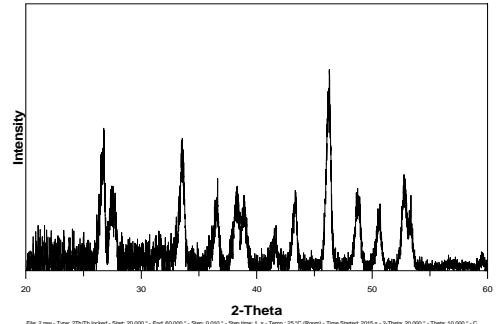
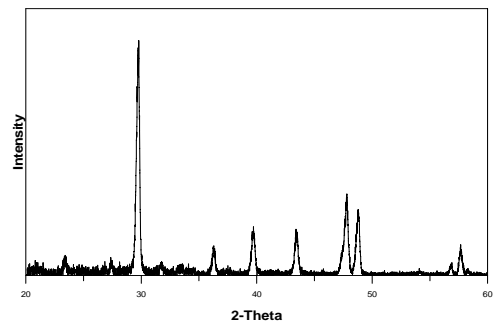


Fig: 10 FTIR Spectrum of final product (after putam)



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Fig 11: X - ray diffraction analysis of raw *Varatika* (Cowrie shell)



File 3.ssw - Type: 2Th/Th locked - Start: 20.0000 - End: 60.0000 - Step: 0.010 - Step time: 0.5 s - Temp: 25.00 °C (Room) - Time Started: 2015-11-03 10:00:01 - Time: 10:00:01 - C

Fig 12: X - ray Diffraction analysis of *Varatika bhasma* (Final product)

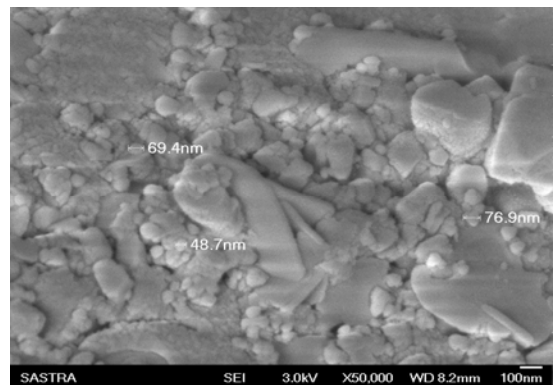


Fig: 13 SEM image (x 50000) of raw *Varatika*

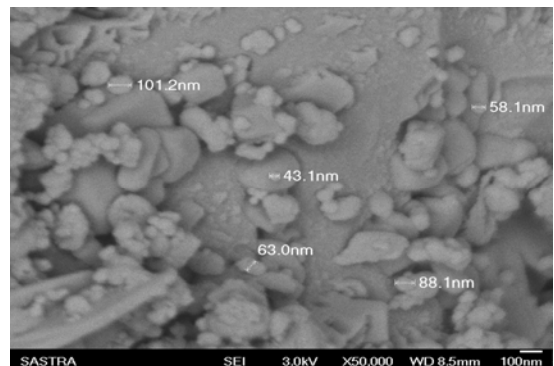


Fig: 14 SEM Image (x 50000) of *Varatika bhasma*

DISCUSSION

Varatika, a mineral drug of animal origin is used in Ayurvedic therapeutics in many diseases. **Varatika** is included in compound preparations also such as Lokanatharasa, Pravalapamritarasa, Grahanikapatarasa etc. **Varatika** is the key ingredient in drugs prescribed in gastrointestinal symptoms.

In the present work a standard preparation of **varatika bhasma** was made and studied scientifically the significance of purification and incineration processes involved in the preparation of this herbomineral formulation. Standards were also determined for this preparation as per Indian Pharmacopeia. Preparation was analysed using sophisticated instruments like Particle size analyzer, FTIR, SEM and XRD.

A comparison of the FTIR spectra of the raw and final product indicates the changes occurred in the finger print region. The qualitative tests performed on the raw and final product indicated the presence of tannin and sugar groups. Particle size analysis revealed the reduction in particlesize due to various processes of purification. SEM and XRD analysis further confirmed the occurrence of nano crystalline compounds in the final product thus light is thrown on the importance of purification process, role of the purifying agents with scientific evidences

Chemical analysis of the raw as well as final product were carried out and reported in Table No - . The data of the results were encouraging and were suggestive of formation of Co-ordination complexes. Increase in the amount of organic constituents like tannins and flavones were noticed which were proven anti oxidants and proven biologically active moieties. Increase in Carbon also indicates the possibility of complex formations. A reduction in the heavy metal content like copper and zinc is observed. All these chemical observations depict that purifying agents play a vital role in removing the toxicity by forming complexes with organic compounds like flavones and tannins and also attains high therapeutic efficacy due to these purifying processes.

CONCLUSION

Present study is undertaken to prove scientifically the significance of purifying processes of this Herbo Mineral Formulation VARATIKA BHASMA. Following conclusions were arrived at:

1. Purifying plant agents helps in the formation of co-ordination complex. Nature of co-ordination complex formed can be determined only after carrying out some more chemical analysis,
2. Particle size analysis indicates reduction in particle size, which must be due to purification processes. SEM data also further confirmed this.
3. XRD pattern confirmed the formation of more crystalline compound which is again due to the impact of various purification and incineration processes.

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