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PHARMACEUTICAL AND ANALYTICAL STUDY OF VAIDOORYA BHASMA

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ABSTRACT

Vaidoorya is one among navaratnas mentioned in classics composed of Beryllium aluminate and explained with its therapeutic indications in the form of Bhasma though its market availability is rare. Rasatarangini is an authoritative text on Rasashastra, have mentioned the use of Vaidoorya bhasma to enhance the intellect, longevity and physical strength. Its judicious use improves the eyesight. It is used in various medicinal preparations like Navaratnamriganka rasa, Indrokta rasayana. In present study its pharmaceutical processing as per text with systematic observation with physico-chemical and instrumental analysis is carried out. The yield obtained after Shodhana of Vaidoorya was 99.09%. The yield obtained after Bhasmikarana of Vaidoorya was 90.00%. The SEM-EDX analysis of Ashodhita Vaidoorya revealed that, Oxygen and Aluminum are the as the major elements. Carbon and Silicon are the minor elements and after Marana of Vaidoorya Increase in aluminium percentage, decrease in oxygen percentage and increase in Carbon % in Vaidoorya Bhasma. As per XRD studies the main component of vaidoorya is Berillium Aluminium oxide.

KEYWORDS:– Vaidoorya, Chrysoberyl, Bhasma, Maraka dravya.

INTRODUCTION

This is an era of drug discovery with an exhaustive method of combinations. To bring out one potent drug molecule to the market it's been a pressure on hands and brain. Though the classical texts of Rasashastra have given elaborative description on therapeutic use of Ratnas it's been in disguise. Vaidoorya is one among navaratnas mentioned in classics composed of Beryllium aluminate and explained with its therapeutic indications in the form of Bhasma

though its market availability is rare. Rasatarangini is an authoritative text on Rasashastra, have mentioned the use of Vaidoorya bhasma[1] to enhance the intellect, longevity and physical strength, in management of Raktha Pittaja vikaras.[2] Its judicious use improves the eyesight. It is used in various medicinal preparations like Navaratnamriganka rasa, Indrokta rasayana.[3] Bhasmas are unique ayurvedic metallic/minerals preparation, obtained by triturating with suitable drugs and medias like herbal juice or decoctions for specified times followed by subjecting the same to high temperature. In these processes the toxic effects of the metals are not only nullified but are transformed into biologically active nanoparticles. As Vaidoorya is not commonly available in the market due to its high value and scarcity, there is no sufficient works available on Vaidoorya bhasma. So to prepare of Vaidoorya Bhasma and to analyze the same, the present work is undertaken.

MATERIALS AND METHODS

Materials

the main drug Vaidoorya (fig.1) and drugs used for marana such as Manashila, haratala, Gandhaka and the associated drugs like Nimbu, Ardraka, Kushmanda, Triphala, Godhugda which are used for Shodhana and Marana of Vaidoorya. Vaidoorya was authenticated by SGTL gems testing lab, Bengaluru, India.

Table no. 1: **Analysis report of vaidoorya by gem testing Lab.**

Gem identification	**Natural cats eye (natural chrysoberyl)**
Shape	oval
Cut	Carbochon
Carat weight	6.750
Dimensions	8.59 x 10.36 x 6.83
Transparency	Translucent

Methods

Vaidoorya was processed using standard procedures and included steps namely Vaidoorya Shodhana (Purification) and Vaidoorya Marana (Calcination). Purification of accessory drugs like Sulphur, Orpiment, Realgar was carried out as per the Rasashastra text.

1) Vaidoorya shodhana[4]

Vaidoorya was subjected to Shodhana by Triphala kashaya (Fig. 2) Swedana in Dola Yantra (Fig. 3) for 3 hours.

2) Vaidoorya marana

Shodhita Vaidoorya was made into fine powder. Fine powder of Manashila, Haratala &

Gandhaka was mixed with fine powder of Vaidoorya. 440g of said mixture (Fig. 4) was subjected to mardana with Nimbu swarasa for 4 hours. When it became semisolid and flakes appeared it was dried under shade. This same procedure repeated for further 6 more times. After 7th Bhavana the chakrikas prepared (Fig. 5) and it was placed in a Sharava samputa and sandhibandhana was done properly. Later this was subjected to gaja puta and allowed for swangasheeta same proceduere was repeated for total 8 times. Then the Sharava Samputa was taken out, sandhibandhana was removed and Marita Vaidoorya (Fig. 6) was collected from Sharava and weighed, powdered and subjected to Bhasma pareeksha. By the completion of 8th Puta, Bhasma sidhi lakshanas attained. For First 5 putas medias like Manashila, haratala, Gandhaka added equal, ½, ¼, 1/8, 1/16 quantity respectively. Further marana continued without adding maraka dravyas, only nimbu swarasa mardana carried out and subjected to gajaputa.[5]

Table no. 2: Summary of bhasma pareeksha during puta.

Tests	**1st to 3rd puta**	**4th puta**	**5th puta**	**6th puta**	**7th puta**	**8th puta**
Colour	Black	Greyish	Greyish	Greyish	ash	Ash
Taste	metallic	tasteless	Tasteless	tasteless	Tasteless	tasteless
Appearance	powder	powder	Powder	Fine powder	Fine powder	Very fine powder
Odour	faint	faint	Faint	faint	Not appreciable	Not appreciable
Rekhapurnata	-ve	+ve	+ve	+ve	+ve	+ve
Varitaratva	-ve	-ve	Partially positive	Partially positive	positive	positive
Unnama					positive	Positive
Apunarbhava	-	-	-	-	-	positive
Niruttha	-	-	-	-	-	positive

RESULTS

Pharmaceutico-analytical study results are described under 2 headings.

1. Pharmaceutical results
2. Analytical results.

Pharmaceutical results

1. Variety of Vaidoorya: Natural Chrysoberyl
2. Total weight of Vaidoorya taken for Shodhana: 110 g.

Vaidoorya shodhana

Weight of Vaidoorya before shodhana- 110g

Weight after shodhana-109g

Table no. 3: Showing result of physical properties of vaidoorya.

Properties	Before shodhana	After shodhana
Colour	Dull blackish green	Shiny blackish green
Touch	Rough and hard	Rough and more malleable
Odour	Odorless	Slight triphala odour
Lustre	Bright greenish white on cut surface	Bright greenish on cut surface

Vaidoorya marana

Weight of Vaidoorya before Marana – 109g

Weight after Vaidoorya Marana – 99g

Analytical results

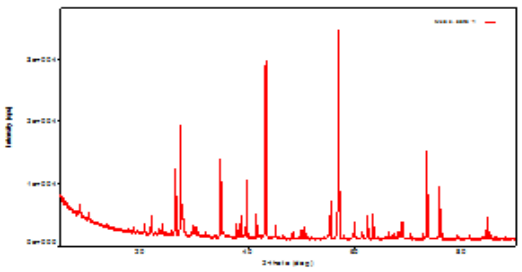
Table no. 4: Showing result of classical parameters for analysis of vaidoorya bhasma.

Sl. no.	Parameters	Vaidoorya Bhasma
1	Varna	Ash color
2	Sparsha	Smooth, fine (Mrudu)
3	Gandha	Nirgandha
4	Varitaratva	Positive
5	Rekhapoornatva	Positive
6	Unnama	Positive
7	Gatarasatva	Positive
8	Niruttha	Positive

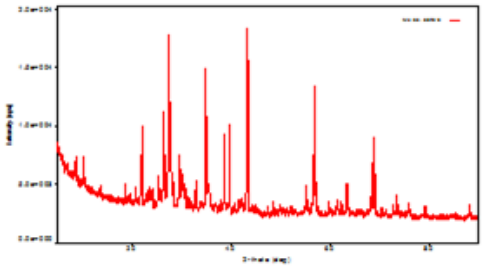
Table no. 5: Showing result of Organoleptic and Physico-chemical characters of Ashodhita Vaidoorya, Shodhita Vaidoorya and Vaidoorya Bhasma.

Parameters	Ashodhita Vaidoorya	Shodhita Vaidoorya	Vaidoorya Bhasma
Colour	Blackish green	Blackish green	Ash
Taste	Tasteless	Tasteless	Tasteless
Odour	-	Characteristic	-
Touch	Amorphous	Amorphous	Amorphous
Total Ash, w/w	89.00%	88.00%	99.04%
Acid insoluble ash, w/w	90.01%	90.01%	90.64%
Water soluble ash, w/w	1.13%	1.15%	1.02%
Loss on drying at 110^0C, w/w	0.04%	0.51%	1.02%
pH	6.35	6.06	7.72

1. X-Ray diffraction results



Graph no. 1: XRD Spectra of ashodhita vaidoorya



Graph no. 2: XRD Spectra of Vaidoorya Bhasma.

SEM-EDS Results

Showing SEM-EDS results of ashodhita vaidoorya

Element	C K	O K	Al K	Si K	S K	As L	Hg M	Totals
Weight%	10.98	47.64	40.2	1.17	0	0	0	100
Atomic%	16.86	54.9	27.47	0.77	0	0	0	100

Showing SEM-EDS results of shodhita vaidoorya

Element	C K	O K	Al K	Si K	S K	As L	Hg M	Totals
Weight%	0	57.53	42.16	0.31	0	0	0	100
Atomic%	0	69.8	29.99	0.22	0	0	0	100

Showing SEM-EDX of vaidoorya bhasma

Element	C K	O K	Al K	Si K	S K	As L	Hg M	Total
Weight%	25.77	5.11	58.63	0	10.48	0	0	100
Atomic%	69.57	10.36	9.48	0	10.6	0	0	100

DISCUSSION

- **Shodhan of vaidoorya -** Triphala Kashaya was used as drava dravya in swedana of vaidoorya, after swedana which has guna's like laghu ruksha teekshna with tiktha and Kashaya rasa pradhana having shodhana, lekhana karma. After shodhana, usually what gem merchants apply wax, oil etc to bring the luster to the gems were removed which is due to gunas of triphala Kashaya i.e., ruksha, lekhana and shodhana properties causing this change.
- **Role of maraka dravyas:** In vaidoorya marana gandhaka is selected as the maraka dravya. Here Gandhaka acts as reducing agent and facilitates the formation of the bhasma easily but at the same time Gandhaka will not get completely evaporated. This residual Gandhaka may affects the therapeutic efficacy of the bhasma which needs to be further evaluated.

In Vaidoorya Marana, Manashila and haratala are selected as maraka dravyas. The probable reason for selecting drugs as maraka dravyas could be: as arsenic renders the metal hardness which helps in transformation of the hard & non homogenous material like metal or mineral to soft, brittle, ductile and homogenous material. In Rasarnava while explaining the qualities of Gandhaka, says Gandhaka Kesari, ie it has a potential to kill the Gaja called Loha, this signifies Special Property of Gandhaka to bring down Metals in to Bhasma form. Thus helps in reduction of hardness of Vaidoorya.

Discussion on XRD study

The X-ray Diffraction studies were done at IISc, Bengaluru. Phase analysis of Ashodhita Vaidoorya, Shodhita Vaidoorya, and Vaidoorya Bhasma was done to crackdown the structure and chemical composition of the samples.

- The diffraction of X-ray is used in the study of the crystalline materials which produce diffraction. X-ray diffraction leads primarily to the identification of crystalline compound from their diffraction patterns. The results of XRD gave chemical composition, structure of samples, d- identified strong peaks are compared with d- standard peaks (ICDD)[6] to confirm the presence of chemical composition, structure of the samples. Phase and structure of the compound is studied after comparing the d-space value with d-standard peak values.
- The XRD study in Ashodhita Vaidoorya showed angle 2θ identified peak values are 44.995, 48.141, 54.737, 55.737, 56.841, 68.307, 73.345 and 75.450. These values matches to chrysoberyl in Orthorhombic crystal structure.
- Shodhita Vaidoorya showed angle 2θ identified peak values are 18.826, 22.137, 24.82, 24.786, 27.514, 32.19, 34.996, 37.937, 38.205, 38.767, 43.269, 48.2727, 51.02, 52.79, 61.426 and 75.873, these values match to Chrysoberyl in Orthorhombic crystal structure.
- Vaidoorya Bhasma showed angle 2θ identified peak values are 18.784, 22.097, 25.872, 27.501, 32.1689, 34.966 37.905, 38.166, 38.738, 39.768, 40.71, 41.705, 43.24, 43.46, 48.589, 55.181, 59.667, 61.396, 68.399, 73.823, 85.3 and 88.124 these values matches to Chrysoberyl in orthorhombic crystal structure.
- As the Berillium Aluminium oxide is a stable compound, hence there may be no change in compound chemically after incineration, And XRD study showed that after converting vaidoorya to bhasma, but structurally lattice parameters suggested change in crystal structure.

Discussion on SEM-EDX: Energy-Dispersive X-Ray Spectroscopy analysis conducted by means of selective electron microscopy study.

- The SEM-EDX analysis was carried out at Indian Institute of Science, Bengaluru. Quantitative elemental analysis of Ashodhita Vaidoorya, Shodhita Vaidoorya and Vaidoorya Bhasma were conducted. According to SEM-EDX reports the elemental compositions of the selected three samples are discussed below.
- Based on SEM-EDX study, the detected elements in Ashodhita Vaidoorya contains C (10.98 %) O (47.64%), Al (40.20%), Si (1.17%), S (0.00%), As (0.00%) Hg (0.00 %), The SEM-EDX analysis of Ashodhita Vaidoorya revealed that, Oxygen and Aluminum are the as the major elements. Carbon and Silicon are the minor elements.
- The detected elements of Shodhita Vaidoorya C (0.00%) O (57.53 %), Al (42.16%), Si (0.31%), S (0.00), As (0.00), Hg (0.00). Oxygen weight % was found to be increased after shodhana.
- The detected elements in Vaidoorya Bhasma O (5.11 %), C (25.77%) Al (58.63%), Si (0.00%), S (10.48%), Hg (0.00), As(0.00). Increase in aluminium percentage, decrease in oxygen percentage and increase in Carbon % in Vaidoorya Bhasma compared to Shodhita Vaidoorya may be due to incorporation of required elements from the pharmaceutical procedures followed.
- SEM-EDS estimated Sulphur about 10.48% where it was null in the raw sample of vaidoorya. Presence of Gandhaka is due to which were used about 244 g as media during Vaidoorya marana.
- SEM-EDS shows complete absence of arsenic compounds even after using about 244g of haratala and manashila each, during the whole procedure of Vaidoorya marana. Which suggests that arsenic componds role in marana is to reduce raw vaidoorya to vaidoorya bhasma which is having a hardness about 8.5, and the end product is safe to administer even after using arsenic compounds because of its complete absence in the end product.
- The minor difference was found in the percentage of major element i.e, Aluminum between the three samples. Shodhita Vaidoorya was having more % of Al compared to Ashodita Vaidoorya and Vaidoorya Bhasma. It may be due to associated impurity in Ashodhita Vaidoorya and in Vaidoorya Bhasma may be due to incorporation of required elements from the pharmaceutical procedure followed.
- Silicon in Vaidoorya Bhasma was absent in its level compared to Shodhita Vaidoorya (0.31%). It may be due using og Manashila, Haratala, gandhaka which are used as maraka dravyas.[7]

Annexure

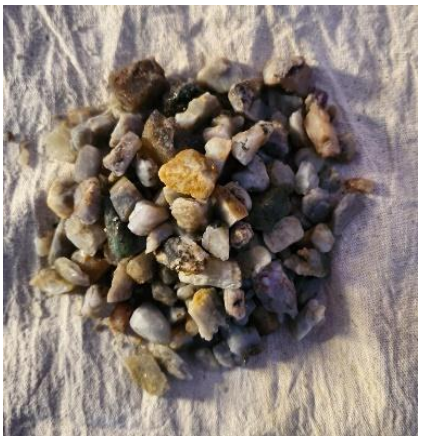


Fig. 1: Raw vaidoorya Fig. 2: Triphala Kashaya Fig. 3: Swedana in dola yantra



Fig. 4: Maraka dravya Fig. 5: Chakrikas before 1st puta Fig. 6: Chakrikas after 8th puta

CONCLUSION

- Vaidoorya is one among the Nava ratna, it has been considered one among the most valuable gemstone and 3rd hardest gemstone. Acharya charaka is the first author to mention internal administration of Vaidoorya.[8] Acharya Somadeva author of Rasendra chudamani[9] considered as the pioneer of introduction of Vaidoorya Bhasma under sarva ratna marana.
- Swedana with Triphala kashaya in dolayantra method is standard operative procedure for shodhana of Vaidoorya.[10]
- Sadananda Sharma, author of Rasa Tarangini first to mention Vaidoorya marana method separately. This is adopted in this study.
- Marana method is by utilizing Manashila, Haratala, and Gandhaka is standard operative procedure for marana of Vaidoorya.

- For Vaidoorya Marana first 8 Gajaputa given in muffle furnace which achieved all the bhasma siddhi lakshanas explained in classics which were appreciated on 8th puta. ▪ The yield obtained after Shodhana of Vaidoorya is 99.16%.
- The yield obtained after marana of Vaidoorya is 90.00%.
- The XRD study in Vaidoorya bhasma showed angle 2θ identified peak values matches to Chrysoberyl in orthorhombic crystal structure.
- Based on SEM-EDX study, Increase in aluminium percentage and decrease in oxygen percentage in Vaidoorya Bhasma compared to Shodhita Vaidoorya may be due to incorporation of required elements from the pharmaceutical procedures followed.
- SEM-EDS shows complete absence of arsenic compounds even after using about total 488g of haratala and manashila, during the whole procedure of Vaidoorya marana. Which suggests that arsenic componds role in marana is to reduce raw vaidoorya to vaidoorya bhasma which is having a hardness about 8.5, and the end product is safe to administer even after using arsenic compounds because of its complete absence in the end product.

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