

ANALYTICAL INVESTIGATIONS ON SOME MINERALS OF MEDICINAL
IMPORTANCE WITH SPECIAL REFERENCE TO UPARASAS

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ABSTRACT

Rasashastra is Ayurveda subject deals with the medicinal importance of metals and minerals. Rasa dravyas can be classified as Maharasa, Uprasa, Sadharanrasa, Dhatu, Ratna and Upratna varga based on their origin and properties. The characterization and standardization of Rasa dravyas is very important to ascertain their quality and avoid any chances of toxic events. The identification and characterization of Uprasa is need of current scenario since depth studies on such elements yet to establish as per the requirements of modern science. Considering this present study was planned to establish identification and characterization parameters of some Uprasa.

KEYWORDS: Ayurveda, Rasashastra, Uprasa, Rasadravyas.

INTRODUCTION

Ayurveda science classically mentioned uses of minerals and metals for various therapeutic purposes. Geology and pharmacology branch of modern pharmaceuticals science also described therapeutic details of such elements. The *Rasashastra* branch of Ayurveda deals with purification, preparation and therapeutic applications of *Rasadravyas*. *Rasa Shastra* encompasses many classical documents related to the metals and minerals based formulations.

The classical Ayurveda formulations prepared from combination of metallic and herbal products (herbo-mineral formulations) used for many diseases but their identification and quality assessment prerequisite to avoid any chances of unwanted health effects. This study aimed to establish quality parameters of some *Uprasa* in a view to explore this science as per modern requirements.

AIM AND OBJECTIVES

- To identify the raw drugs of *Uprasa* by physical and chemical properties as per Ayurveda classics.
- Mineralogically identifying them as per norms of modern mineralogy and establish standardization of raw drugs mentioned in *Uprasa varga* of *Rasa Ratna Samucchaya*.

Materials

Following compounds considered from *Uprasa varga* were analyzed:

✚ *Gandhaka*

✚ *Gaireeka*
✚ *Kaseesa*
✚ *Kankshi*
✚ *Hartaal*
✚ *Manahshila*
✚ *Anjana*
✚ *Kankushtha*

Methods

The following tests were carried out for analysis of selected *Uprasas*:

- SEM-EDX
- PETROGRAPHY
- XRD, XRF
- Tests for: Color, Luster, Electric conductivity, Heat conductivity, Hardness, etc.

**GANDHAK****GAIREEKA****KASEESA****KANKSHI****HARATAAL****MANAHSHILA****ANJANA****KANKUSHTHA**

RESULT AND DISCUSSION

Gandhaka is considered first element of *Uparasa* group, study identified yellow and white coloured *Gandhaka*. *Gandhaka* observed with smooth and translucent appearance. It possesses peculiar smell, cleavage is indistinct and uneven fracture obtained. Streak test revealed white streak. It was found as bad conductor of heat and electricity while tested analytically. It was found insoluble in acids and soluble in chloroform. XRF revealed chemical composition of the raw minerals as 50.28% of sulphur, 0.01% of Fe_2O_3 , 0.17% of SiO_2 and 0.12% of Al_2O_3 . Petrography revealed grain structure with irregular edges.

Gaireeka is considered *Uparasa*, it is oxide of haematite and it's also termed as Ochre. *Swarna Gaireeka* found as *Snigdha* with soft texture features, *Pashana Gaireeka* found as *Ruksha* with pale red colour. Physical analysis revealed pseudo-cleavage with hardness, showed metallic lustre and gives streak of cherry red colour. XRD suggested presence of SiO_2 , Al_2SiO_2 and Fe. XRF suggested presence of 61.4% SiO_2 , 18.27% Al_2O_3 and 8.01% Fe_2O_3 , etc. SEM-EDX revealed presence of Al, Si, O, Mg, K and Fe. Petrography revealed presence of clay sized grains.

Kaseesa is well-known mineral of *Uparasa* group, used as source of iron and prepared by the action of H_2SO_4 over iron powder. XRD analysis showed presence of Melanterite and Rozenite $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$. Its showed perfect cleavage and brittle fracture, easily fusible, lustre is vitreous, different shades of green and becoming yellowish on exposure to atmosphere. Streak test revealed streak of white colour and sub-transparent to translucent in appearance. XRF revealed presence of sulphur 19.47%, Al_2O_3 12.21%, SiO_2 0.19% and Fe_2O_3 0.28%. SEM-EDX study revealed presence of sulphur and oxygen. Petrography revealed presence of *Kaseesa* grains as aqueous in the form of bubbles.

Kankshi is another *Uparasa*, also known as *Sphatika*, two samples; white and reddish brown coloured were taken and analysed instrumentally. XRD of both revealed that it is Potash Alum with chemical formula: $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$. XRF revealed presence of sulphur, Al_2O_3 , Fe_2O_3 and SiO_2 molecules. SEM-EDX revealed presence of oxygen, aluminium and sulphur. It was observed with vitreous lustre to dull; streak test revealed white colour streak and appearance was observed transparent to translucent with distinct cleavage. Brittle fracture was observed characteristics features of Potash Alum.

Hartaal or **Haritaal** is mineral of *Uparasa* category. Study identified **Hartaal** as orpiment and in XRD study it revealed as orpiment (Arsenic trisulphide with chemical formula As_2S_3). Monoclinic and small crystals, with foliated or columnar masses, highly perfect cleavage, pearly to resinous lustre, uneven fracture and sub transparent to translucent appearance. Streak test revealed pale yellow streak, XRF suggested presence of Sulphur 21.63%, Arsenic 29.9% and MgO 12.2%. SEM EDX showed presence of As, S, Fe and Ca, etc. Petrography showed Pleochorism with the strong internal reflection in grains.

Manahshila is mineral compound of Arsenic and Sulphur. Arsenic mono sulphide (AsS) interpreted in XRD and XRF revealed presence of Sulphur, Arsenic, MgO and Al_2O_3 . SEM-EDX confirmed presence of Arsenic and Sulphur molecules. Petrography revealed presence of transparent/ translucent grains with low pleochroism and granular aggregation. Cleavage was also observed, reddish yellow in colour and brittle in nature.

Anjana is mineral belongs from *Uparasa* category, XRD showed presence of PbS, XRF showed presence of MgO, Al_2O_3 , K_2O , CaO, SiO_2 and Fe_2O_3 , etc. Petrography of Galena showed opaque grains with triangular pits, hairy conchoidal fracture, cubic cleavage and irregular grain boundaries also observed. Reticulated and tubular crystals found in cubes with perfect cleavage and grey in colour with metallic lustre. Streak test revealed greyish black streak, having opaque diaphaneity and metallic lustre observed.

Kankushtha is controversial drug explained in *Uparasa* group; three samples were analyzed in present study. XRD suggested presence of Magnesium Carbonate, XRF revealed presence of SiO_2 , MgO, Al_2O_3 and CaO, etc. Petrography explained grains, fractures with quartz, perfect cleavage with flat conchoidal fracture and vitreous lustre. Yellowish white in colour with transparent to opaque diaphaneity.

CONCLUSION

Conclusions are drawn based on the observation and interpretations made during whole study.

- As per the all instrumental analysis the Gandhak which was taken for the study is having maximum amount of sulphur. Raman was not done as it is an ignitious substance.
- In case of gaireeka it is not having much amount of Fe in it. It also contains Si, Al, Mg, and K. It is a quartz structure which contains more amount of silica in it than Fe. The synonyms told by Acharyas completely explain about the grain morphology- Grimridbhava as clayey, silty and sandy grains. Girimrittika suggests presence of clay which is confirmed in all analytical parameters as presence of SiO_2 and Al_2O_3 .

- As there is no standards set for kaseesa it was so difficult to recognize it with the amount of Fe present in it. It was matching with the Standards of Melanterite and Rozenite.
- In kankshi here I found that it contains Al, S, O, Fe, Si, Na, K, and Cl compounds in it along with high amount of water molecules.
- Hartaal and manahshila was matched with the standards of orpiment and realgar respectively.
- Anjana samples which were taken from market, college and nature all the three which were name in the market as neelanjana, srotanjana and sauveeranjana were analysed. The analytical report was pointed as galena. In rasanjana when SEM-EDX was done and I found that it contains Fe, Si, K, Mg, Al, S, Ca, Pb, P, Na and Cl. On doing alkaloid content analysis it also contains 12.87% alkaloids in it. According to all analytical studies it is a mineral drug and on the basis of Rasa Texts. But, few of the recent authors have compared it with herbal drug which should be elicited and confirmed therapeutical action of both samples i.e herbal and mineral which could be the scope for further study.
- Since there is no standard of mineral kankushtha and is considered as controversial and rare drug told by Acharyas and texts of Rasa Shastra. It was not possible to appropriately identify the material. In the absence of such knowledge it is not possible to define the composition and mineralogy of this material. As per the Grahya lakshana and physical properties and action I took magnesite as kankushtha and the sample was matching to the standards of it.

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