



Research Article

COMPARATIVE XRF ANALYSIS OF KRISHNABHRAKA AND PATRA ABHRAKA

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ABSTRACT

Abhrak (mica) is an important mineral next to *Parada* and *Gandhaka* in *Rasashashtra*. It is counted under *Maharasa Varga*. Chemically, *Abhrak* is mainly a combination of iron, aluminum, silica, magnesium, potassium and zinc. *Abhrak Bhasma* has a wide range of therapeutic action in various diseases such as *Kasa* (cough), *Swasha* (asthma), *Panduroga* (anemia), *Shwetapradara* (white discharge) etc. Mainly two types of *Abhrak* i.e., *Patra abhrak* (*Shweta Abhrak*) and *Krishna Abhrak* are available in the market. *Krishna* or *Vajrabhraka* is exclusively taken for preparation of *Abhrak Bhasma* whereas use of *Patrabhraka* is restricted to the preparation of *Rasamanikya* etc. **Aim and Objectives:** There is difference in physical properties of both *Abhraka*, so the chemical composition needs to be assessed. To analyze this difference comparative XRF analyzation of *Krishna* and *Patra Abhrak* were carried out. **Methods and Materials:** Both samples of *Abhraka* were procured from the market and sent for XRF study. **Observation and Result:** In XRF analysis, percentage of Fe₂O₃, MgO and CaO were higher in *Krishna Abhrak* whereas percentage of SiO₂, and Al₂O₃ were high in *Patra Abhrak*. **Conclusion:** Higher percentage of ferrous and magnesium signifies the chemical composition of *Krishna Abhraka*. The presence of more silica and aluminum in *Patra Abhraka* states its heat stability for pharmaceutical purposes.

INTRODUCTION

Abhrak (mica) is an important mineral next to *Parada* and *Gandhaka* in *Rasashashtra*. It is counted under *Maharasa Varga*. *Abhrak Bhasma* has a wide range of therapeutic action in various diseases such as *Kasa* (cough), *Swasha* (asthma), *Panduroga* (anemia), *Shwetapradara* (white discharge), etc.^[1] It is also known for its *Vrishya* (aphrodisiacs), *Balya* (physical and mental strengthening), *Hridhay* (heart tonic), *Netra* (eye tonic) and *Rasayana* properties.^[2] Chemically, *Abhrak* is mainly a combination of iron, aluminum, silica, magnesium, potassium and zinc.^[3] *Abhraka* is of four types -*Pinakabhraka*, *Nagabhraka*, *Mandura bhraka* and *Vajra bhraka*. According to the colour, it is of four types i.e., *Shwetabhraka*, *Peetabhraka*, *Raktabhraka* and *Krishna Abhraka*.^[4] Mainly two types of *Abhraka* i.e., *Patra Abhrak* (*Shweta abhrak*) and *Vajrabhrak* (*Krishna Abhrak*) are available

in the market. *Krishna* or *Vajrabhraka* is exclusively taken for preparation of *Abhrak Bhasma* whereas use of *Patrabhraka* is restricted to the preparation of *Rasamanikya* etc. But most of the time *Patrabhraka* is marketed in the place of *Krishabhraka* due to its scarcity and cost factor. There is different in chemical composition of both *Abhraka* which need to be analyze by different techniques. Although, there are various analytical techniques to analyze the chemical composition of minerals and metals such as A.A.S, EDAX, XRF etc, of which XRF (X-ray fluorescence) is a non-destructive analytical technique used to determine the elemental composition of materials. It is an excellent technology for qualitative and quantitative analysis of material composition. It is simple, fast and safe with low cost. So, the present study was planned to identify the difference in chemical composition of both *Abhraka* samples with the help to XRF study.

AIM AND OBJECTIVES

There is difference in physical properties of both *Abhraka*, so the chemical composition needs to be assessed. To analyze this difference comparative XRF analysis of *Krishna* and *Patra Abhrak* were carried out.

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METHODS AND MATERIALS

For this study, *Krishna Abhrak* were procured from Ajmer, Rajasthan, which had all the *Grahya lakshana* (specific characteristics). The *Abhraka* which is having *Pratudala* (broad layers), *Snigdha guna* (unctuous), *Neelanjana varna* (bluish black), *Bharatodika* (heavy weight) and *Sukhanirmocha patra* (layers are easily separable) is said to be *Shresta* (genuine) described in *Rasaratna samucchaya*.^[5] *Patra Abhrak* (*Shweta*) were procured from the local market of Hazaribagh, Jharkhand state. Both samples of *Abhraka* were subjected for organoleptic analysis by

classical methods. It was then sent for XRF analysis in analytical laboratory. *Shodhan* of *Krishna Abhrak* and *Patra Abhrak* were carried by *Nirvapa* process (heating and quenching in liquid media) with the help of *Triphala kwath* ^[6] (decoction of *Triphala*). *Abhraka* was kept for heating over *Bhatti*. When *Abhraka* became red hot then it is immediately quenched in *Triphala kwatha*. After attending normal temperature *Abhraka* filtered out and again heated. This procedure was repeated for 7 times^[7]. Each time new fresh *Triphala kwatha* was used for quenching, average temperature of at the red hot stage of *Abhraka* - 750°C.

Figures of *Abhraka* samples



Fig no.1: *Krishna Abhraka*



Fig no. 2: *Patra Abhraka*

Shodhan (Purification) of *Abhraka*



Fig no.3: *Ashuddha Krishna Abhraka*



Fig no.4: *Ashuddha Patra Abhraka*

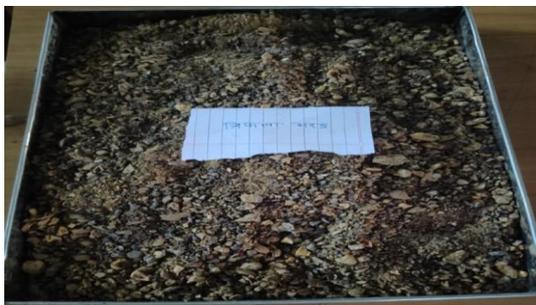


Fig no.5: *Triphala Bharad*



Fig no.6: *Red hot stage of Abhraka*



Fig no.7: *Nirvapana* of *Abhraka* in *Triphala kwath*



Fig no.8: *Shodhit Abhraka* after 1st *Nirvapana*

Fig no.9: Sodhit Abhraka after 7th Nirvapana

RESULT AND DISCUSSION

Table 1: Organoleptic analysis of Krishna and Patra Abhraka

S.No	Physical Characteristic	Krishna Abhraka	Patra Abhraka
1	Colour	Black shiny	Whitish black
2	Touch	Rough	Soft
3	Luster	Lustrous shiny	Whitish shiny
4	Fracture	Uneven	Uneven
5	Smell (<i>Gandha</i>)	Not specific	Not specific

Table 2: Comparative XRF Analysis of Krishna and Patra Abhraka

S.No.	Component	Krishna Abhrak	Patra Abhrak	Unit
1.	Fe ₂ O ₃	8.74	6.51	Mass%
2.	MgO	20.2	0.815	Mass%
3.	SiO ₂	45.7	51.0	Mass%
4.	Al ₂ O ₃	9.86	31.5	Mass%
5.	K ₂ O	6.99	9.47	Mass%
6.	CaO	6.94	0.0303	Mass%
7.	TiO ₂	0.851	0.227	Mass%
8.	SO ₃	0.219	0.145	Mass%
9.	Cr ₂ O ₃	0.133	--	Mass%
10.	BaO	0.123	--	Mass%
11.	NiO	0.0691	--	Mass%
12.	MnO	0.0572	0.0997	Mass%
13.	SrO	0.0164	--	Mass%
14.	ZnO	0.0112	0.0604	Mass%
15.	CuO	0.0042	0.0040	Mass%
16.	CdO	0.0008	0.0005	Mass%
17.	HgO	(0.0001)	(0.0006)	Mass%
18.	Nb ₂ O ₅	--	0.0857	Mass%
19.	ZrO ₂	--	0.0014	Mass%
20.	As ₂ O ₃	--	(0.0001)	Mass%
21.	PbO	--	0.0062	Mass%

DISCUSSION

Abhraka is the most important mineral due to its wide therapeutic potential. It contains more than 40 minerals which fulfill the physiological need of essential elements and minerals. As per one of the research study, its mineral contents should be evaluated for the purpose of its quality. XRF analysis is easy and cost effective technique to analyze and

quantify the minerals in it. Mica mineral (*Abhrak*) has 16 varieties, out of which only one, *Krishna* (black), *Vajra* (does not split or swell upon heating) *Abhraka* (sheets/layers) is used for making *Bhasma* as per the reference of *Rasatarangini*. However, there are some references regarding use of *Shwetabhraka* in *Bhasma* preparation in classics of *Rasashashtra*. Also, due to

high cost of *Krishnabhraka*, there may be use of *Shwetabhraka* in place of *Krishnabhraka*. Hence the purpose of this study was to study difference in chemical composition of both *Abhraka*.

In organoleptic characteristics of both *Krishnabhraka* and *Patrabhraka* (Table no: 1) the classical signs were noted and observed which signifies its *Grahya Lakshana* (physical properties). The chemical composition of both *Abhraka* is slightly different. *Krishnabhraka* is biotite mica, a ferromagnesium silicate $K(MgFe)_3X(Si_3AlO_{11})X(OH)_2$ as per API (Ayurvedic Pharmacopeias of India) and is rich in iron and magnesium (ferromagnesium mica). One research study reported that *Shwetabhraka* ($K_2O, 3Al_2O_3, 4SiO_2$) is muscovite and mostly rich in potassium, aluminium and silica.

In XRF analysis (Table:2), it was observed that the percentage of ferric oxide (8.74), magnesium oxide (20.2) and calcium oxide (6.94) were higher in *Krishna Abhrak* as compare to *Patrabhraka* which is 6.51, 0.815 and 0.0303 respectively which signifies the importance of high iron, magnesium and calcium content in *Krishnabhraka*. Also the percentage of magnesium and calcium were minimum in *Patrabhraka*, whereas percentage of silicon dioxide (51.0), and aluminium oxide (31.5) were high in *Patra Abhrak* as compare to *Krishna Abhraka* which is 45.7 and 9.86 respectively which signifies the importance of high silica and aluminium content in *Patra Abhraka*. *Krishna Abhrak* (black biotite mica) is rich in essential macro and micronutrients like Mg, Fe, K, Si, Cu, etc as per one of the research study. It contains iron in ferric oxide form. Ferric oxide form of iron is easily absorbable by human body and has proven beneficial effects over human body in various disease conditions as per one of the research study.

Also, there is presence of many trace elements such as $TiO_2, SO_3, MnO, ZnO, CdO, CuO$ and HgO in both samples however Cr_2O_3, BaO, NiO are present in *Krishna Abhraka* only and Nb_2O_5, ZrO_2, As_2O_3 and PbO are present in *Patra Abhraka* only. Although the

composition of both samples is vary in terms of major and minor minerals contents, its needs to be validated as per classical guidelines for better therapeutic results. Further it needs to compare the difference between *Bhasma* of both *Abhraka* analytically.

CONCLUSION

Higher percentage of ferrous and magnesium signifies the importance of chemical composition of *Krishna Abhraka* as per classics. The presence of more silica and aluminium in *Patra Abhraka* indicates its heat stability which can be use as a medium for various pharmaceutical purposes

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