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Consequences of Different Medium in the Pharmaceutical Processing's of Metals and Minerals w.s.r. to *Abhraka Shodhana* – An Analytical Study

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Abstract

Shodhana is an important intermediately process of purification and detoxification by which physical and chemical blemishes along with toxic materials of metals and minerals are eliminated & substances are subjected for further pharmaceutical processing. It is an important intermediately pharmaceutical process during conversion of metals and minerals into *bhasma* (ash). *Abhraka* is an important mineral used in *ayurvedic* pharmaceutics. It is used in the form of *bhasma* to treat many diseases. Various liquid media are described for the *shodhana* process of *abhraka* (biotite). *Shodhana* of *abhraka* was done in the specific mediums i.e. cow-urine, decoction of *triphala* and *badari* separately. To find out the significance of these media X Ray diffraction, scanning electron microscopy study and energy dispersive x-ray analysis of *abhraka* were carried out. X Ray diffraction findings shows that different media are not changing main compounds of *abhraka* after *shodhana* processes. Field emission scanning electron microscopy (FESEM) study reveals that the plate late structure of *abhraka* not only remains intact but also became more granular and appears to be microcrystalline along with reduction in particle size after *shodhana* process. Energy dispersive x-ray analysis (EDAX) reflects the compositional variations of elements.

Keywords

Abhraka, bhasma, shodhana, ayurveda, X Ray diffraction, Field emission scanning electron microscopy, Energy dispersive x-ray analysis

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INTRODUCTION

Rasa Shastra also regarded as *ayurvedic* pharmaceutics literally means knowledge of '*Rasa'*. In *Rasa Shastra*, *Rasa* means *Parada* (mercury) [1]. Other various substances described in this branch are of metals, minerals, vegetable and marine origin. They are used for therapeutic and alchemical purposes and called as '*Rasadravyas'*. These *rasa dravyas* are basically classified in various groups as – *Maharasa*[2] , *Uparasa* [3], *Sadharanarasa* [4], *Dhatu varga* [5], *Upadhatu* [6], *Sudhavarga*[7], *Ratnavarga* [8], *Uparatnavarga* [9] etc.

Abhraka is the first *dravya* of *Maharasa* group[10] and possessing second position in the literature of *Rasa Shastra* next to the *Parada*. It is so either due to its medicinal property or due to its role in conversion of lower metal to the higher ones.

Abhraka Bhasma is in frequent use for medicinal purposes in *ayurveda*. *Shodhana* is an important stage of pharmaceutical processing's of *Abhraka bhasma*. Metal & minerals were in use for therapeutic purposes since *samhita* period. But their frequent use in the therapeutics started since development of *Rasa Shastra* from medieval period. During this period various pharmaceutical processing like *shodhana*, *marana* and *satvapatana* etc. also developed and advancement by using various technology in this field occurs. In *ayurvedic* pharmaceutics process of *Shodhana* has its importance because the *dravyas* used for medicinal purposes are of metal, mineral, vegetable and animal origin. So the process of *shodhana* [11] is an essential to remove the external impurities as well as to make the drug ready for other pharmaceutical processes. It is a process by which blemishes are separated from the substance by various processing like grinding etc. with specific drugs. It may also be regarded that *shodhana* is a process in which addition & deletion of contaminates occur which makes it suitable for therapeutic use. So, it can be stated that basically it is a process of contamination which makes it suitable for further use and may be regarded as pretreatment of the drugs whereas *marana* (calcination) as post treatment.

Various techniques along with different media are referred in *ayurvedic* texts[12,13,14] for the *shodhana* process of *abhraka*. Among them *nirvapa*[15] process (heating to red hot stage and immediately quenched in liquid medium) for seven times is most acceptable. Cow's urine (*gomutra*),

decoction of *triphala* {pieces of dry fruits *Haritaki* (Emblica officinalis), *Vibhitaki* (Terminalia bellirica) & *Amalaki* (Terminalia chebula)}, and decoction of *badari* (zizyphus jujuba) are frequently used as medium [16,17,18].

MATERIALS AND METHODS

Pharmaceutical processing of *Abhraka*

Raw *abhraka* (Biotite) was procured from *Ayurvedic* Pharmacy of Banaras Hindu University, Varanasi and subjected to *shodhana* process according to traditional *ayurvedic* procedures[19]. Raw *abhraka* and liquid media were taken in a clean iron pan and steel vessel respectively. Iron pan was kept on charcoal burner and peak temperature of charcoal burner was maintained with the help of electric blower. *Abhraka* flakes were turned up and down with metal tongs to provide uniform heating. When the *abhraka* (biotite) flakes reached at the stage of red hot condition (approx. 850^0C), it was quickly quenched into the liquid media and then *abhraka* pieces were separated by filtering through iron sieve and collected in an iron pan. *Triphala kwath*, cow's urine and *badari kwath* were used as media for *shodhana* and the process is repeated for seven times in each media separately. Samples were obtained after the complete process of *shodhana* and code was given as in **Table 1**.

Table 1 Sample coding of different product after *shodhana* process

S. No.	Name of the Sample	Code
1.	Krishna Vaj*abhraka*.	1
2.	Triphala Kwath Shodhit *Abhraka*	2
3.	Gomutra Shodhit *Abhraka*	3
4.	Badari Kwath Shodhit *Abhraka*	4

Analytical technique:

X-ray Diffraction (XRD)[20] is a powerful non-destructive technique for investigation of structural properties of crystalline materials. Diffraction pattern is produced when a crystalline material is irradiated with a collimated beam of x-ray. The diffraction pattern and the intensity of each diffracted x-ray as a function of the diffraction angle can provide information such as crystal structures, phase purity, grain size etc.

A small quantity of samples was crushed to very fine size powder in an agate mortar. These powders were then mounted on the sample holder of a commercial high resolution X-ray power diffractometer fitted with a curved monochromator. This diffractometer operates on "Bragg-Bretano geometry". An eighteen KW rotating anode generator was used as a source of X-ray. This machine was of Rigaku make with model No. Rint 2000/PC series. The XRD

data were collected in the fully automatic mode and stored in the personal computer.

Field emission scanning electron microscopy and Energy dispersive x-ray analysis:

The samples were analyzed using FESEM coupled with EDAX (model: Quanta – 200ESEM). Before analysis, the samples were converted into fine powder form by means of a glass mortar. A small amount of the sample was mounted to the stub with silver glue, prepared with silver powder and isopropyl alcohol.

RESULTS AND DISCUSSIONS

X-ray Diffraction :

Results of XRD studies are shown from Fig.1 to 4 and table 2 to 5. On comparing the XRD data available for all the six samples reveals that strongest three peak of all the samples are nearby same. These are shown in table 6.

	cosθ)			degree)
1.	17.642	5.0233	32	.1393
2.	23.958	3.7113	16	.1458
3.	26.569	3.3522	1000	.1476
4.	31.175	2.8667	9	.1669
5.	35.662	2.5156	125	.1656
6.	44.988	2.0134	87	.1853
7.	54.653	1.6780	36	1.6792
8.	60.010	1.5404	10	.3328
9.	64.757	1.4384	34	.1349

Table 3 Details of peak of Triphala Kwath (purified) *Abhraka*

S. No.	Angle (2 cosθ)	D-spacing	Rel. Intensity	FWHM (in degree)
1.	17.702	5.0064	61	.1582
2.	26.650	3.3422	1000	.1681
3.	27.169	3.2796	49	.2905
4.	35.767	2.5085	108	.1632
5.	45.156	2.0063	68	.2303
6.	54.802	1.6738	47	.1991

Table 4 Details of peak of Gomutra (cow's urine) shodhit (purified) *Abhraka*

S.No.	Angle (2 cosθ)	D-spacing	Rel. Intensity	FWHM (in degree)
1.	17.759	4.9905	59	.1487
2.	24.106	3.6890	19	.2364
3.	26.725	3.3330	1000	.2222
4.	33.840	2.6467	17	.3211
5.	34.185	2.6208	26	.4025
6.	35.858	2.5023	86	.3036
7.	45.267	2.0016	76	.2990
8.	53.446	1.7130	17	.4793
9.	54.992	1.6684	41	.3553

Table 2 Details of peak of Krishna Vaj*abhraka* (Raw material)

S. No.	Angle (2	D-spacing	Rel. Intensity	FWHM (in

Table 5 Details of peak of Badari Kwath shodhit (purified) *Abhraka*

S.No.	Angle	D-	Rel.	FWHM

	(2 cosθ)	spacing	Intensity	(in degree)
1.	17.743	4.9950	64	.1985
2.	24.126	3.6858	29	.4641
3.	26.734	3.3319	1000	.2757
4.	34.179	2.6212	27	.2120
5.	35.843	2.5033	82	.4215
6.	45.444	1.9942	50	.4202
7.	54.965	1.6692	39	.4935

Table 6 The strongest three peak of all the samples

Sample No.	1st Strongest Peak (2 cosθ)	2nd Strongest Peak (2 cosθ)	3rd Strongest Peak (2 cosθ)
1.	26.656	35.662	44.988
2.	26.650	35.765	45.156
3.	26.725	35.858	45.267
4.	26.734	35.843	17.743

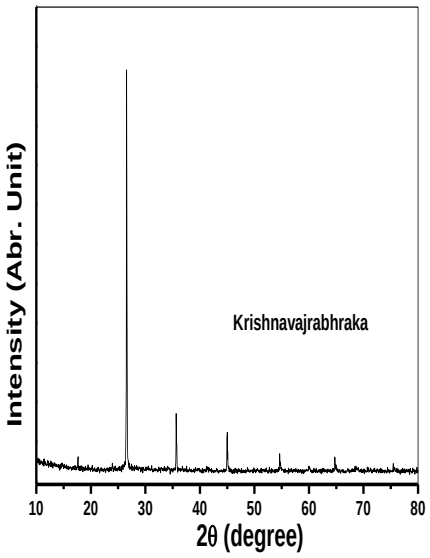

Fig 1. XRD Pattern of Raw Abhraka

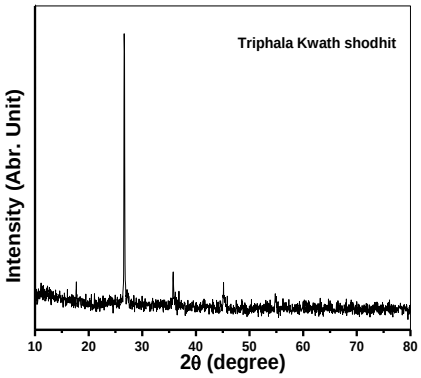

Fig 2. XRD Pattern of Triphala Kwath Shodhit Abhraka

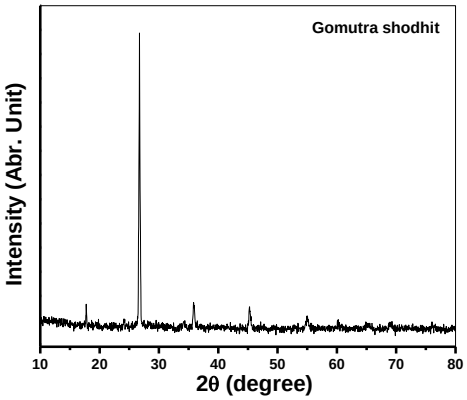

Fig.3: XRD Pattern of Triphala Kwath Shodhit Abhraka

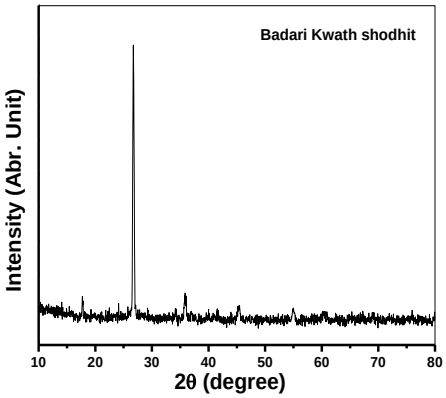

Fig 4: XRD Pattern of Triphala Kwath Shodhit Abhraka

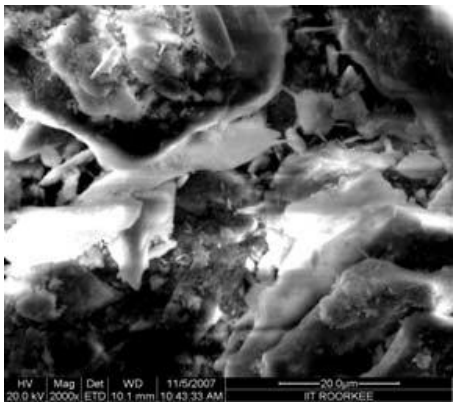

Fig. 5: FESEM Photograph of Raw *Abhraka*

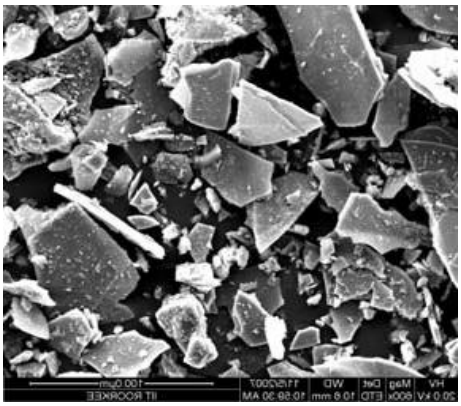

Fig. 6: FESEM Photograph Triphala kwath shodhit *Abhraka*

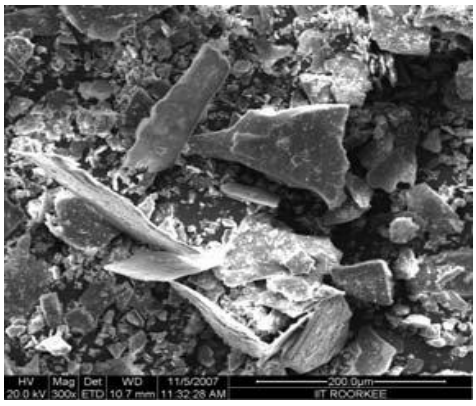

Fig: 7: FESEM Photograph Gomutra shodhit *Abhraka*

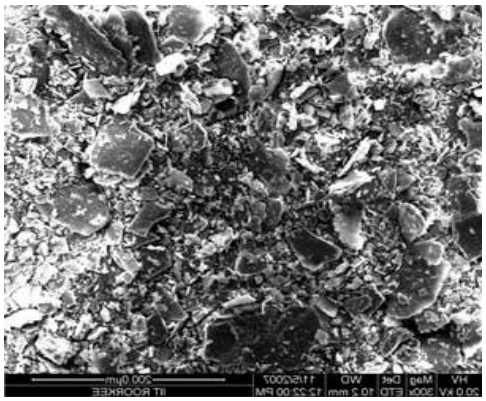

Fig.8: FESEM Photograph Badari kwath shodhit Abharaka

JCPDS data available shows after comparing with findings that the raw material *Krishna Vajra Abhraka* (Biotite) used is Potassium Iron Magnesium Aluminum Silicate Hydroxide having following formula

$K\ (Mg, Fe^{+2})\ 3\ (Al, Fe^{+3})\ Si_3O_{10}\ (OH, F)_2$

It also shows that there is no much structural change in the above complex mixture of compound occurs. But there is some addition and deletion of peaks are occurring. This is due to the addition and deletion of some compounds in very minor amount which could not be found after comparing with JCPDS data. In the sample six which is *Badari Kwath Shodhit* 3rd strongest peak is different from others.

Field emission scanning electron microscopy (FESEM) : Results of FESEM studies are shown in Fig.5 to 8. Fig.5 shows the presence of layered structure along with

granular particles within the layered structure. In Fig. 6 layered like structure is present but the granular particles have been decreased as compare Fig.5 (raw material). Fig.7 shows that maximum density and size of granular particle have been increased significantly. In Fig.8 the layered and granular structures are less. FESEM results revealed that the plate late structure of *abhraka* was remains intact even after *shodhana* process. However they became more granular and appeared to be microcrystalline. Particle size in the *shodhit* samples were decreased as compare to the raw material. Maximum reduction in the particle size was appeared in the sample treated with decoction of *badari*.

Energy dispersive x-ray analysis (EDAX)

Energy dispersive X- ray analysis was used to analyze elemental composition of samples. The results are tabulated in Table 7 and 8 These tables show the weight (%) of major and minor element present in different samples.

Table 7 and 8 show that the raw material (Sample – 1) contain Fe, Si, K, Mg, Al, K, C and O in the major quantity (major element) where as F, Cl, Pd and Ti were also found in the sample. It appears that raw material (biotite) contains Mg, K, Fe, Al and Silicate with carbon present in it from the natural organic matter. The weight (%) of several elements taken together indicates the presence of the predominant silicate group along with aluminum-silicate group with Fe and Mg as ionic species. Significant variation in the major and minor elements composition was observed after *shodhana* process using different media. In major elements, % weight of Mg, Al and Si was decreased whereas Fe and K increased. Some additional minor elements were found added and some were eliminated after *shodhana*. Cl and Ti were detected only in raw sample. Maximum numbers of minor elements were added in the sample 2 in which *triphala kwath* was used as media. Source of new elements present in the *shodhit* samples may be elements presents in the media.

CONCLUSIONS

The present studies exemplify the significance of *shodhana* process (purification) in the preparation of *abhraka* (biotite) based *ayurvedic* formulations. Results also revealed the importance of media in the *shodhana*. Various physico-chemical changes were occurred depending upon the selection of the media

during the *shodhana* such as reduction in particle size as shown by FWHM pattern of XRD study, differences in peaks are due to variation in elemental composition of major elements and addition as well as deletion of minor elements from the raw material.

Field emission scanning electron microscopy and Energy dispersive x-ray analysis also reveals

the changes occurs in the *shodhana* process such as reduction in particle size, variation in density and granular size, variation in elemental composition of major elements and addition as well as

deletion of minor elements from the raw material by using different medium. Differences in the data are due to the different media used in the *shodhana* process of *abhraka*.

REFERENCES

1. Kulkarani, D.A.: Rasa Vagbhata's *Rasa RatnaSammucchaya*, MeharchandLacchman Das, New Delhi, 21, 1992.
2. Shastri, K.N.: Sadanand Sharma's *Rasa Tarangani*, MotilalBanarasi Das, Varanasi, 22, 2002.
3. Mishra, S.N.: Somdeva'sR*asendraChudamani*, ChaukambhaOrientalia, Varanasi, 135, 2004.
4. Sharma, Gulraj. : Madhava's *AyurvedaPrakash*, ChaukambhaBharati Academy, Varanasi, 284, 1999.
5. Tripathi, I.D.: GopalkrishnaBhata's*RasaedraSarSangraha*, ChaukambhaOrientalia, Varanasi, 4, 2003.
6. Dr. Shailaja Srivastava, Acharya Sarngadhar's Sgarngdhar Samhita, Chaukhamba Orientallie, 3rd Edition, 2003,
7. Kulkarani, D.A.: Rasa Vagbhata's *Rasa RatnaSammucchaya*, MeharchandLacchman Das, New Delhi, 21, 1992.
8. Kulkarani, D.A.: Rasa Vagbhata's *Rasa RatnaSammucchaya*, MeharchandLacchman Das, New Delhi, 21, 1992.
9. Shastri, K.N.: Sadanand Sharma's *Rasa Tarangani*, MotilalBanarasi Das, Varanasi, 22, 2002.
10. Mishra, S.N.: Somdeva's R*asendraChudamani*, ChaukambhaOrientalia, Varanasi, 135, 2004.
11. Sharma, Gulraj. : Madhava's *AyurvedaPrakash*, ChaukambhaBharati Academy, Varanasi, 284, 1999.
12. Tripathi, I.D.: GopalkrishnaBhata's *RasaedraSarSangraha*, ChaukambhaOrientalia, Varanasi, 4, 2003.
13. Kulkarani, D.A.: Rasa Vagbhata's *Rasa RatnaSammucchaya*, MeharchandLacchman Das, New Delhi, 21, 1992.
14. Kulkarani, D.A.: Rasa Vagbhata's *Rasa RatnaSammucchaya*, MeharchandLacchman Das, New Delhi, 21, 1992.
15. Shastri, K.N.: Sadanand Sharma's *Rasa Tarangani*, MotilalBanarasi Das, Varanasi, 22, 2002.
16. Mishra, S.N.: Somdeva's R*asendraChudamani*,

ChaukambhaOrientalia, Varanasi, 135, 2004.

17. Sharma, Gulraj. : Madhava's *AyurvedaPrakash*, ChaukambhaBharati Academy, Varanasi, 284, 1999.
18. Tripathi, I.D.: GopalkrishnaBhata's *RasaedraSarSangraha*, ChaukambhaOrientalia, Varanasi, 4, 2003.
19. Kulkarani, D.A.: Rasa Vagbhata's *Rasa RatnaSammucchaya*, MeharchandLacchman Das, New Delhi, 21, 1992.
20. Westgren A (1932). "ZurChemie der Legierungen". AngewandteChemie 45 (2): 33.