

Role of media in the pharmaceutical processing of Krishna Vajra Abhraka - A Fourier Transmission Infrared Spectroscopy study (FTIR)

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ABSTRACT

Krishna Vajra Abhraka (Biotite) is an important and potent mineral used as medicine for different therapeutic purposes in the Ayurveda since long back. Abhraka is not used directly in the native form as founds in the ore. It is subjected to different pharmaceutical processing like Shodhana and Marana (incineration) described in Ayurvedic texts that converts into therapeutically important form. These processes lead to physico-chemical changes in the Abhraka which makes therapeutically suitable form. In this paper an attempt has been made to find out the chemical changes takes place in the Abhraka after process of Shodhana from different Media by Fourier transmission Infrared Spectroscopy Study (FTIR).

Key words: Krishna Vajra Abhraka, Shodhana, Fourier transmission, Infrared Spectroscopy Study, Media

INTRODUCTION

Metallic and mineral preparations are in frequent use for therapeutic purposes in Indian System of Medicine especially Ayurveda since many centuries. During the medieval period (8th – 10th century) many pharmaceutical processing's like Shodhana, Jarana, Marana (incineration), Satvapatana (extraction) etc. developed in Ayurveda for metallic and mineral preparations. Above developments resulted in more frequent use of Metallic and Mineral preparations in therapeutics and drugs prepared using above processes are known as Rasaushadhies. These Rasaushadhies have innate qualities like quick action, lesser dose; tastelessness, prolonged self-life & better

palatability¹. Due to these qualities metallic and mineral preparation have given a unique, comprehensive health care approach to Indian system of medicine for serving as global medical system. In Ayurvedic pharmaceuticals the process of Shodhana has its importance because the dravyas (materials) used for medicinal purposes are of metal, mineral, vegetable and animal origin. Shodhana is a process of purification and detoxification by which physical and chemical blemishes, toxic materials are eliminated & substances are made suitable for further processing. So the process of Shodhana ²is an essential process to remove the external impurities as well as to make the drug ready for other pharmaceutical processes.

According to Ayurvedic texts, Shodhana should be done before using the Abhraka because Ashodhit (unpurified) Abhraka³ produces harmful effects like Kustha (leprosy), Pandu (anemia), Shotha (swelling), Hritshula (chest pain), etc. Most acceptable Shodhana process of Abhraka described in Ayurvedic texts is Nirvapa^{4,5} process (Heating to red hot stage and immediately quenched in media). Many liquid Media are described in Ayurvedic text for this purpose⁶ and were also used by different workers⁷⁻⁹ for the Shodhana process of Abhraka. This process converts Abhraka into suitable form for further processing. Recent advances in analytical techniques such as spectroscopy, electron microscopy, crystallography etc. have provided unprecedented view of structure of drug that can be used to analyze the effect of these processes on raw material.

MATERIAL AND METHODS

Materials

Abhraka used for the present study was procured from Ayurvedic Pharmacy, Institute of Medical Sciences, Banaras Hindu University. Then it was subjected to Shodhana process according to traditional Ayurvedic procedures. Abhraka was taken in an iron pan and required amount of liquid media (Kanji, Godugdha, decoction of Triphala, Gomutra and decoction of Badari) was taken in separate steel vessel. 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 & down with metal tongs to provide equal exposure of heat to both the surfaces. It was done in regular intervals. When the Abhraka flakes reached at the stage of red hot, it was quickly quenched into the media with the help of metal tongs. The medium was separated by filtering it through iron sieve and soft pieces of Abhraka were collected in an iron pan. Process is repeated for seven times in each medium like Kanji (gruel), Godugdha (cow's milk), decoction of Triphala {pieces of dry fruits of Haritaki (*Embolia officinalis*), Vibhitaki (*Terminalia bellirica*) & Amalaki (*Terminalia chebula*)}, Gomutra (cow's urine) and decoction of Badari (*Zizyphus Jujuba*) separately. Different Media are taken out for comparative analysis of effect of media on the Shodhana process. Abhraka obtained after seven times is shodhit one and collected

separately in sterile glass for further studies. The pH of these Media are tabulated in table 1.

Method

Samples of raw Abhraka and shodhit Abhraka were taken and grounded with Potassium Bromide (KBr) to prepare sample for FTIR analysis. The samples were then subjected for Fourier transmission Infrared Spectroscopy analysis to find out the effect of different Media on the Shodhana process of Krishna Vajra Abhraka

RESULTS AND DISCUSSION

The results of the FTIR studies are shown in Fig. 1 to 6. The presence of various compounds in these samples can be analyzed on the basis of these figures and are presented in table 2 and 3. The Fourier Transmission Infrared Spectroscopy spectra of the raw material and shodhit material done shows that H-bonded acidic hydroxyl group, water molecule, Aluminum and Iron in both tetrahedral and octahedral coordination, Magnesium compound, $(\text{SiO}_4)_n$, $(\text{SiO}_6)_n$, $(\text{MoO}_6)_n$ are commonly present in each sample. The $(\text{MoO}_6)_n$ peaks offered probable arise out of impurities in the metal present in the raw material and shodhit materials. The presence of water molecules is very strongly indicated in raw material Abhraka where as this absorption peak has diminished in peak of Triphala kwatha and cow's milk shodhit (purified) Abhraka but it is strongly absorbed in other i.e. Kanji, Gomutra and Badari kwath shodhit Abhraka .

There are number of minor peaks of NO_2 ¹⁻, SO_3 ²⁻, M-OCO_2 (CO) and M-CO (M = unknown

Table 1- The pH of Media used for Shodhana process are as follows

Media	pH
Triphala kwath	3-4
Godugdha	6.6-6.8
Gomutra	8-8.5
Badari kwath	8-9
Kanji	3-3.4

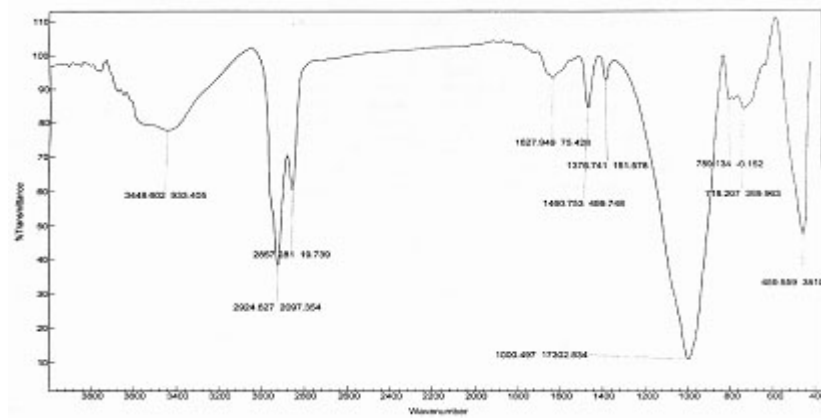


Fig. 1: FTIR of Krishna vajra abhraka

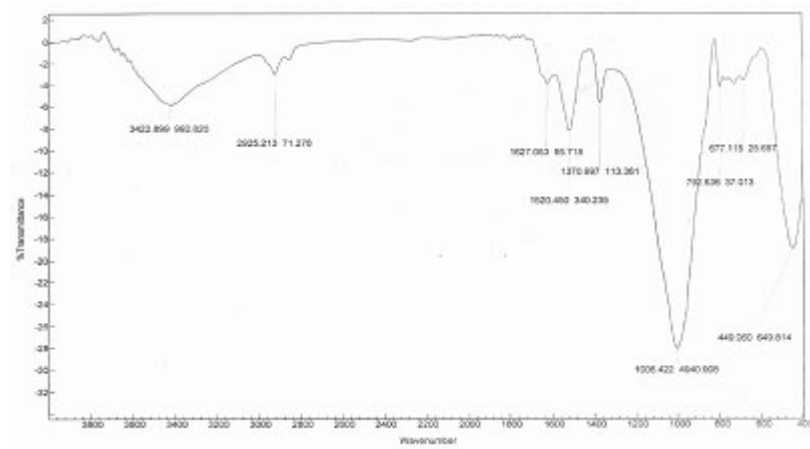


Fig. 2: FTIR of Kanji shodhita abhraka

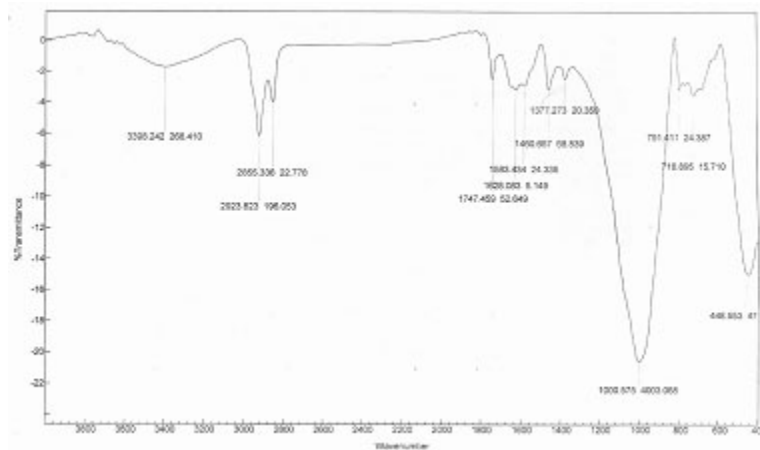


Fig. 3: FTIR of Godugdha shodhita abhraka

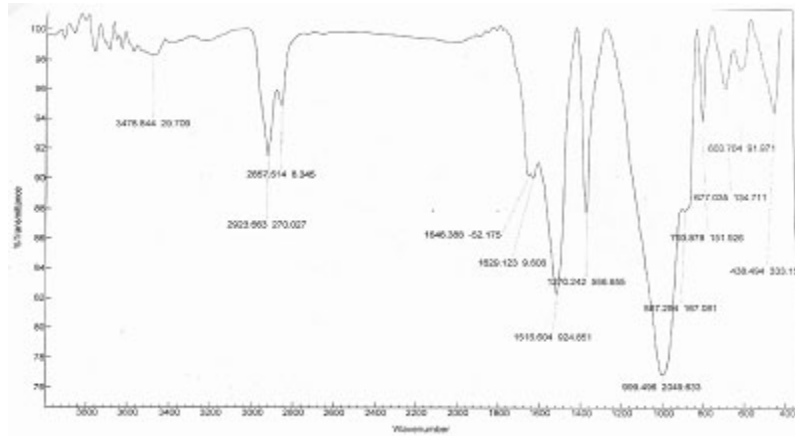


Fig. 4: FRIT of Triphala kwath shodhita abhraka

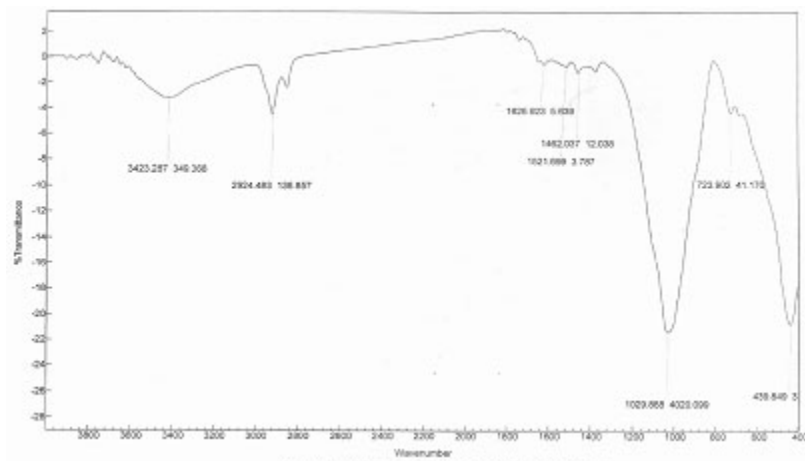


Fig. 5: FTIR of gomutra shodhita abhraka

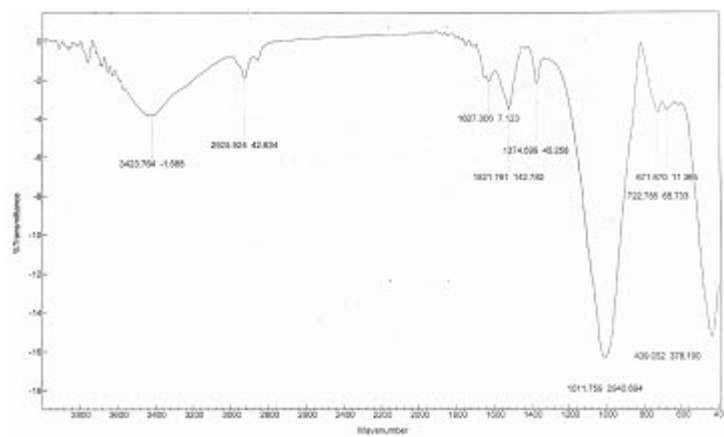


Fig. 6: FTIR of badari kwath shodhita abhraka

metal) are also found that arises in different regions indicate the presence of different compound / functional group in different samples. These peaks may be due to the small amounts of carbonates, nitrites and sulphate present in raw material and shodhit material. These small peaks indicates that

the different liquid media used for the process of Shodhana leads to some addition and deletion of compounds / functional group in raw material that probably makes the material suitable for further pharmaceutical processing and for therapeutic use.

Table 2: Common compound / functional group found in raw material and all shodhit samples

S.No.	Wavelength (Cm ⁻¹)V _{max}	Common compound / Functional group
1.	2800-2950	H-bonded acidic hydroxyl group
2.	1630	Water molecule
3.	400-900	Aluminum in both tetrahedral and octahedral coordination
4.	350-550	Magnesium compound
5.	400-750	Iron in both tetrahedral and octahedral coordination
6.	900-1200, <500	(SiO ₄) _n
7.	600-950	(SiO ₆) _n
8.	750-1000 , 500 cm ⁻¹	(MoO ₆) _n

M= metal

Table 3: Different compound / functional group found in raw material and all shodhit samples

Sample	Wavelength (Cm ⁻¹)(V _{max})	Common compound / Functional group
Raw Abhraka	1376.741	NO ₂ ¹⁻
	1376.741	SO ₃ ²⁻
	1460.753	M-OCO ₂ (CO)
Kanji Shodhit Abhraka	1370.997	NO ₂ ¹⁻
	1370.997	SO ₃ ²⁻
	1520.450	M-OCO ₂ (CO)
Godugdha Shodhit Abhraka	1377.273	NO ₂ ¹⁻
	1377.273	SO ₃ ²⁻
	1583.434, 1460.657	M-OCO ₂ (CO)
	1747.459	M-CO
Triphala Kwath Shodhit Abhraka	1370.242	NO ₂ ¹⁻
	1516.604	M-OCO ₂ (CO)
Gomutra Shodhit Abhraka	1462	NO ₂ ¹⁻
	1521	(ONO)
	1521.040	M-OCO ₂ (CO)
Badari Kwath Shodhit Abhraka	1374.599	NO ₂ ¹⁻
	1374.599	SO ₃ ²⁻
	1521.761	M-OCO ₂ (CO)

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