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Validation of lodhradi kashaya (Ayurvedic formulation) made by traditional method and contemporary spray drier method through FTIR spectroscopy

Varun Kumar Singh, K R C Reddy*

Ph.D scholar, Department of Rasa Shastra, IMS, Banaras Hindu University, Varanasi, India

*Professor, Department of Rasa Shastra, IMS, Banaras Hindu University, Varanasi, India

*Corresponding Author: K R C Reddy

Email - drkrcreddybhu@yahoo.co.in

ABSTRACT

Lodhradi Kashaya is a classical formulation mentioned in Vaidya Chintamani under Kaphaj prameha and also in Basavarajiyam under prameha prakarana. The therapeutic efficacy of the Lodhradi Kashaya was described as 'Madhumehajeet', i.e. win over Diabetes Mellitus. In the classical wisdom, it was indicated to administer as decoction but in present fast moving and taste driven world it is difficult to made decoction each time. So here an approach was made to modify the decoction dosage form in to spray dried powder that again can be easily converted to decoction just by dissolving suitable quantity of dosage form in appropriate amount of water. To validate the spray dried powder of Lodhradi Kashaya, two sample was made one from spray drier (LKSD) following the continuous complete aqueous extraction and second in laboratory (LKLb) following traditional method to prepare decoction and dried to form powder. Both the sample were analysed by FTIR spectroscopy. Absorbance pattern in the IR spectra indicate that there is no significance variation found in LKLb and LKSD. The peaks were found similar in pattern and the absorbance corresponding to the allotted chemical interactions was similar which reflects that both the sample was similar in their chemical composition. This study presents the data showing the chemical similarities between classical method of preparation and contemporary machinery involvement. It is also step in the field of commercialization of kwath kalpana in modified dosage form and it is the need of time to make low cast, stable drugs that will be easy in distribution and administration.

Keywords: Infrared, Spectroscopy, Lodhradi Kashaya, Spray drier.

INTRODUCTION

Approximately 347 million people are diabetic worldwide, among which 90% are suffering with Type - 2 diabetes mellitus [1]. In 2011, India had 62.4 million people with type 2 diabetes, compared with 50.8 million the previous year, according to the International Diabetes Federation (IDF) and the

Madras Diabetes Research Foundation [2]. Ayurvedic medicines are attracting global population to treat and prevent various diseases and disease complications by their holistic approach to heal since antiquity. Ayurvedic literature having various references for the treatment of *Madhumeha* (Diabetes), there are many formulations and lifestyle procedures were mentioned for its regulation and treatment. In Vaidya Chintamani

many decoction formulations were mentioned for treatment of *Madhumeha*, *Lodhradi kashaya* is one of them mentioned for the treatment of *Kaphaj prameha*[3]. Basavarajiyam also mentioned same formulation containing the decoction of *Lodhra*, *Haritaki*, *Musta* and *Katphala* for the management of *Madhumeha* and effect of this formulation is mentioned as “*Madhumehajeet*” [4]. This formulation is containing four ingredients *Lodhra* (Stem bark), *Haritaki* (Fruit pulp), *Musta* (Rhizome) and *Katphala* (Stem bark) [Table-1]. Since in classical text suggested dosage form was *kwath* (Decoction) for *prameha* but in present busy life schedule it became difficult to prepare fresh *kwath* at each administration. So in present study an approach was made to prepare instant *kashaya* powder with spray drier technology with the *kwath* prepared by classical methods. Shelf life of the *kwath* prepared by traditional method is 24 hr as classical text. So here mainly two problems are with such formulation, one is to modify it into suitable dosage form and second is to improve stability period. Authors here make an approach towards this problem and found a satisfactory data analysis. FTIR spectroscopy was used for the evaluation. Multiple beam internal infrared reflection spectroscopies have been used to identify the chemical nature of molecule. It is used to determine the

functional group of the compound along with the wholesome identity of the molecule thus it was used as qualitative tools for molecular structure elucidation. The IR region of the electromagnetic spectrum has dimension of wavenumbers extending from 13000 cm^{-1} to 10 cm^{-1} , with near IR, mid IR, and far IR regions spanning from 13000 cm^{-1} to 4000 cm^{-1} , from 4000 cm^{-1} to 400 cm^{-1} , and from 400 cm^{-1} to 10 cm^{-1} wavenumbers, respectively [5]. The selective absorption (or emission) of infrared radiation arises in the mutual vibrations of the atoms constituting the molecules. A molecule does not absorb radiation of all wave lengths but selects only a few narrow wave-length intervals which are known as absorption bands. The resulting absorption pattern is characteristic of the molecule. The vibration frequencies within a molecule are determined by the masses of the atoms, the strength of the forces which bind them, and the geometrical structure of the molecule. In the case of organic compounds there is only slight dependence on the state of aggregation of the molecules, and the factors lead to vibration frequencies corresponding to wave lengths lying in spectral range. The *Kashaya* dried powder was scanned by IR spectroscopy and the result were analysed in reference to variation between two samples.

Table.1. Ingredients of Lodhradi kashaya

Serial	Plant	Botanical name	Family	Part used
1.	<i>Lodhra</i>	<i>Symplocos racemosa</i> Roxb.	Symplocaceae	Stem bark
2.	<i>Hareetaki</i>	<i>Terminalia chebula</i> Retz.	Combretaceae	Fruit pulp
3.	<i>Musta</i>	<i>Cyperus rotundus</i> Linn	Cyperaceae	Rhizome
4.	<i>Katphala</i>	<i>Myrica esculenta</i>	Myricaceae	Stem bark

METARIALS AND METHODS

Lodhradi *Kashaya kwath* was made in laboratory [LKLB] by classical method (Sharangdhar samhita) [6] and dried to form Ghana powder by traditional method of heating. One other sample was made with same raw material using the concept of continuous aqueous extraction and drying of extract with spray drier technology [LKSD]. Both the sample was taken for their FTIR scanning to know the variation in the chemical compositions. The *kwath* of the raw material were also prepared and subjected to dryness followed by grinding to get fine powder. For IR scanning, sample was optimized to ensure minimal water content and moisture free environment. The sample were

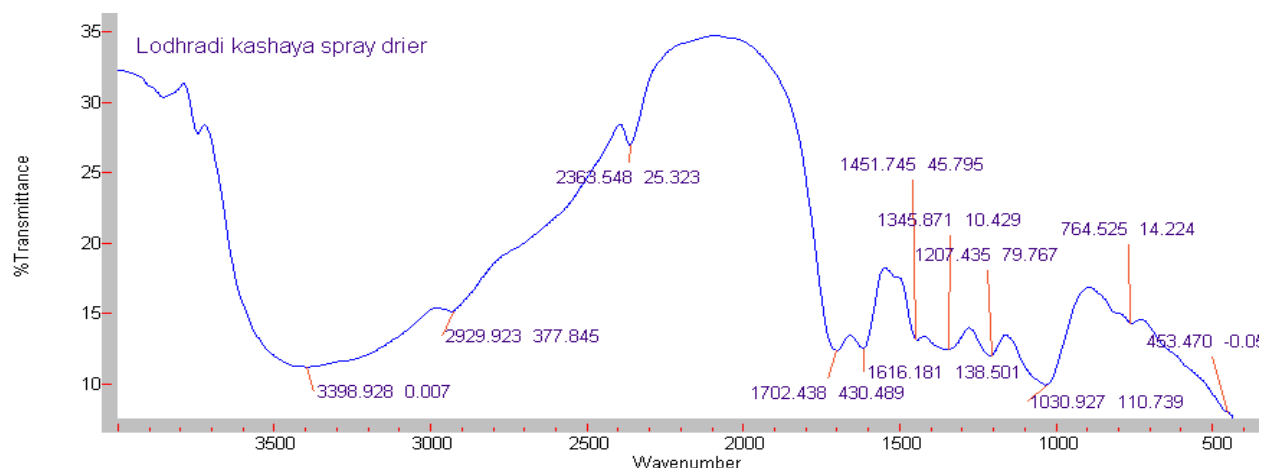
mixed with KBr in proportion to 1:100 ratio and presses to form pellet by press pellet technique using Hydraulic pressure [7]. IR spectroscopy (Varian 640 IR spectrophotometer) was first calibrated and then the pellet made from two samples was scanned under same condition.

RESULTS

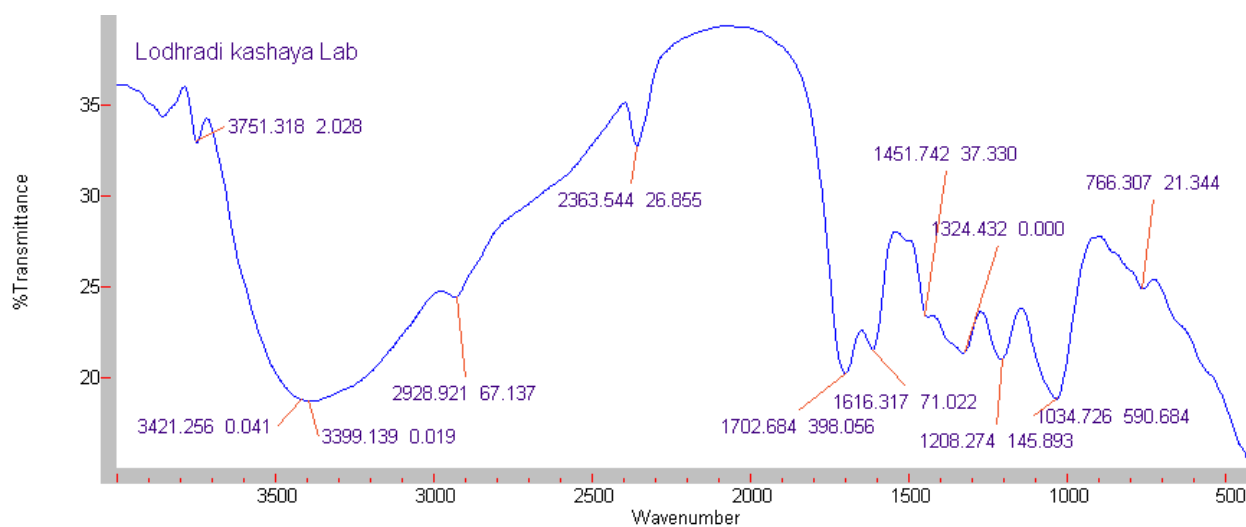
Scanning in Varian IR spectroscopy, gives spectra regarding the sample scanned [Graph-1 & Graph-2]. These spectra were interpreted in context of comparative studies of sample LKLB & LKSD. Both the samples were analysed for variation in the functional group and bonding pattern when it was

prepared by two different methods. The absorption peak of spectra of LKLB and LKSD were compared [Table-2] which reflect that there are no significance

variation in both sample prepared by two different technique and by use of advanced machineries.



Graph.1. FTIR spectra of LKSD



Graph.2. FTIR spectra of LKLB

Table.2. Absorption peaks FTIR spectroscopy for LKLB and LKSD

Sr. No.	Peaks in LKLB (cm^{-1})	Peaks in LKSD(cm^{-1})
1	766.3	764.5
2	1034.7	1030.9
3	1208.2	1207.4
4	1324.4	1345.8
5	1451.7	1451.7

6	1616.3	1616.1
7	1702.8	1702.4
8	2363.5	2368.5
9	2928.9	2929.9
10	3399.1	3398.9
11	3421.2	3421.2
12	3751.3	3751.3
13	3858.6	3856.9

DISCUSSION

Lodhradi Kashaya is the preparation of kwath (decoction) dosage form in which drugs are heated in prescribed amount of water and reduced up to 25% volume and indicated for oral administration. The shelf lives of these kwath are 24 hour when prepared by traditional method [8]. Shelf life is the prime concern in the decoction dosage form as to fulfill the demand of population shelf life should be longer. Keeping this point, Lodhradi Kashaya was prepared by replacing traditional method of kwath preparation with modern continuous aqueous extraction technique. The machinery used in preparation has also been replaced by contemporary extraction vessel and spray drier for drying purposes. But the fundamental principle of traditional knowledge have been preserved as the spray dried powder was found better solubility in water so administration was again in decoction form by dissolving it into suitable quantity of water prior intake. But to know the effect on nature of Lodhradi Kashaya prepared by modified technique, here approach has been made to study their chemical profiling by IR spectroscopy. Two sample prepared by classical method and contemporary method are evaluated on the basis of IR spectra and their absorption pattern. Absorption peaks found at 766.3, 1034.7, 1208.2, 1324.4, 1451.7, 1616.3, 1702.8, 2363.5, 2928.9, 3399.1, 3421.2 and 3751.3 cm^{-1} in LKSL was significantly similar to that of abs peak of LKSD 764.5, 1030.9, 1207.4, 1345.8, 1451.7, 1616.1, 1702.4, 2368.5, 2929.9, 3398.9, 3421.2 and 3751.3 cm^{-1} when compared [Table-2]. It shows that the chemical present is probably similar to each other because it was prepared from same raw materials too. The present study shows that ancient knowledge can be validated and the dosage form can be modified on the edge of contemporary sciences. Absorption peak in the range 3000 to 4000 cm^{-1} is 3399 & 3398, 3421, 3751 cm^{-1} which denotes present of hydroxyl group either in H-binding or in free state [9]. Broad peak at 3399 and

nearby reflect presence of hydroxyl group which may be due to tannins, polyphenols and phenols in the formulation. Peak in the range 2000 to 3000 is around 2363/2378, 2928/2930 cm^{-1} in both samples. Absorption at 2928 and 2930 cm^{-1} indicate presence of alkane stretching vibration, asymmetric stretching vibration in C-H which is due to presence of carbohydrate tail in the formulation. Peak I the range 1500 to 2000 was found at 1616 and 1702 cm^{-1} which reflect presence of NH(amide) II bond that is carboxylic derived and C=O stretching of saturated aliphatic ester. Absorption peaks found in the range 1000 to 1500 are 1034, 1208, 1324 and 1451 cm^{-1} . Peak at 1451 & 1452 cm^{-1} indicates CH₂ and CH₃ deformation or C-O-H bending or alpha-CH₂ bending vibration which are due to the presence of larger carbohydrate/sugar molecule and glycosides etc [9,10,11]. peak at 1324,1345 cm^{-1} denote presence of O-C (acid) bond overlapping that is due to acidic constituents of the phytoextract. Peak at 1208 cm^{-1} reflect the presence of stretching C-O bonding vibration that may be due to the polyphenols and phenolic presence in the Lodhradi Kashaya. Peak at 1034 cm^{-1} indicate OH-CH stretching in sugar and polysaccharide [11]. Thus the absorption peaks found in the LKLB and LKSB were similar in their pattern and their intensity too. Though only IR spectra cannot give a full proof validation data for the formulation but preferably it draw a clear cut inference that modified form of Lodhradi Kashaya (LKSD) was chemically similar to that of conventional dosage (LKLB). It is a nice step toward validation of ancient wisdom using contemporary sciences.

CONCLUSION

Lodhradi Kashaya is the preparation of Basavarajiyam and also mentioned in Vaidya Chintamani to treat madhumeha. It is indicated to administer as Kashaya (decoction) but in present fast moving and taste driven world it was difficult to prepare kwath each day. So in

present study same kwath was dried to form powder (Ghana) by conventional method (LKLB) and secondly raw material was exhausted by continuous aqueous extraction to get maximum yield and dried by Spray drier (LKSD). Both samples were scanned by IR spectroscopy to know the similarities. IR absorption pattern shows that both the formulation was similar in their chemical nature. Absorption peaks also denotes different types of functional group and bonding present the Lodhradi Kashaya. This study will be helpful in

finding difference in the chemical nature of formulation when modified in reference of present contemporary science and materialistic world.

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