

# Interpretation of Chanaka Yoga by Fourier transform infrared spectroscopy

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## Abstract

**Aim:** To evaluate possible interaction in Chanaka Yoga, which is used in Prameha Prakaran. **Materials and Methods:** For IR scanning, the samples were mixed with KBr in proportion to 1:100 ratio and compressed to form pellet using hydraulic compression machine. All the samples were analyzed for variation in the functional group and bonding pattern since the final sample is the mixture of all the six ingredients. **Results and Discussion:** The peaks found in FTIR spectra of Chanaka Yoga shows the presence of hydrogen-bonded alcohol and phenols, hydrogen-bonded acid, aldehydes and ketones, aromatic hydrocarbons, ketones, esters and aldehydes, alcohol and ether, alkenes and alkenes. **Conclusion:** Peaks of Chanaka Yoga were found similar in pattern, and the absorbance corresponding to the allotted chemical constituents was similar with the ingredients analyzed separately. This study shows a pathway for the chemical basis of similarity in a pattern in inference when ayurvedic formulation has a multi-ingredient concept.

**Key words:** Chanaka Yoga, diabetes, Fourier transform infrared, interaction, interpretation

## INTRODUCTION

Approximately 347 million people are diabetic worldwide, among which 90% are suffering with Type 2 diabetes mellitus.<sup>[1]</sup> 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 and the Madras Diabetes Research Foundation.<sup>[2]</sup> It has also been reported by the WHO that in 2014, the global population suffering from diabetes is 9% among adults aged 18 and more years.<sup>[3]</sup> The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs especially the eyes, nerves, kidneys, heart, and blood vessels (Guideline for Type 2 diabetes mellitus ICMR publication). Ayurveda is being used since a long time ago for curing of many of the diseases and as well as it has treated people suffering from madhumeha. It has been declared that by the prescribed consumption of rasasauadhis madhumeha can be treated effectively.<sup>[4]</sup>

Chanaka consists of flavonoids such as quercetin, isoquercetin, kaempferol-3-glucoside, astragaloside, populnin, biochenin-A-7-glucoside, isorhamnetin, protensein, garbanzol, and cyanogenic glycosides. It has been used

therapeutically for the treatment of annadravasula (gastric ulcer), chardi (emesis), daha (burning sensation), jvara (fever), kasa (cough), pinasa (chronic rhinitis/sinusitis), prameha (metabolic disorder), sosa (emaciation), svasa (asthma), trsna (thirst), and udara (diseases of abdomen). Haridra, i.e., popularly known as haldi or turmeric has been reported to have numerous medicinal properties as it has constituents such as essential oil and a coloring matter (curumin). Therapeutic uses of haldi include visavikara, kustha, vana, tvagroga, prameha, pandu, sitapitta, and pinass. Daruharidra mainly consists alkaloids and has therapeutic uses such as kandu, medoroga, mukharoga, varna, amatisara, urustmbha, kaphroga, karnaroga, netraroga, and meha. Haritaki has been used to treat vibhandha, aruchi, udavrata, gulma, udararoga, arsa, pandu, sotha, jirnajvara, visamajvara, prameha, siroroga, kasa, tamaka svasa, and hardroga. Bibhitaki contains gallic acid, tannic acid, and glycosides as its major constituents. It has been used to treat svarabheda, netraroga, kasa, chardi, krimiroga, and vibhandha. Amalaki commonly known as

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amla mainly consists of ascorbic acid and gallotannins. It also possess great medicinal value and has been used for the treatment of raktapitta, amlapitta, prameha, and doha.<sup>[5]</sup>

Amalaki, Haritaki, Bibhitaki, and Daruharidra along with other medicinal ayurvedic plants have been reported to treat madhumeha by Ankush *et al.*<sup>[6]</sup> They have orally subscribed triphaladi granules to 51 patients in a dose of 5 g twice a day. Result observed was that Group A showed moderate improvement in 37.5% cases and 50% cases showed improvement of diseased condition. Group B also showed a moderate improvement in 16% of cases and 56% as mild improvement after the treatment. One finding of an experimental study done<sup>[7]</sup> by the support the above-traditional view that combination of turmeric and Indian gooseberry can provide benefit to diabetic patients. In combination, these two plant products probably potentiate the actions of each other. The hypoglycemic effect of turmeric has been suggested to be due to increased peripheral glucose utilization decreased hepatic glucose synthesis and/or increase in insulin secretion. Therefore, this formulation can be effectively used as medicine as well as consumed regularly as a dietary supplement in case of diabetes mellitus and pre-diabetic patients.

Multiple beam internal infrared reflection spectroscopies have been used to identify the chemical nature of the 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 range of the infrared spectrum discussed and extended from about 2.5  $\mu$  (25,000  $\text{\AA}$ ) to approximately 25  $\mu$ . The IR region of the electromagnetic spectrum has dimension of wave numbers extending from 13000  $\text{cm}^{-1}$  to 10  $\text{cm}^{-1}$ , with near infrared (IR), mid-IR, and far IR regions spanning from 13000  $\text{cm}^{-1}$  to 4000  $\text{cm}^{-1}$ , from 4000  $\text{cm}^{-1}$  to 400  $\text{cm}^{-1}$ , and from 400  $\text{cm}^{-1}$  to 10  $\text{cm}^{-1}$  wave numbers, respectively.<sup>[8]</sup> The selective absorption (or emission) of infrared radiation arises in the mutual vibrations of the atoms constituting the molecules. Therefore, this study was conducted to analyze the possibilities of the components that could be present in Chanaka Yoga, Chanaka, Haridra, Daruharidra, Haritaki, Bibhitaki, and Amalaki powder.

The ingredients of the Chanaka Yoga are given in Table 1.

## MATERIALS AND METHODS

The present study was conducted at Rajiv Gandhi South Campus, BHU, Mirzapur, Uttar Pradesh. It consists of the study of ingredients, i.e., Chanaka Yoga, Chanaka, Haridra, Daruharidra, Haritaki, Bibhitaki, and Amalaki. All these components were purchased from local market of Varanasi. The coarse powder was prepared in the laboratory of Ayurvedic Pharmacy, BHU, Varanasi, by classical method (Vaidya Chintamani). Each ingredient was dried properly in regular sunlight. The pulp and seeds of each compound were separated. The pulp was grinded properly into coarse powder. All ingredients were mixed in equal proportion, i.e., Chanaka Yoga, then each powdered ingredient separately and Chanaka Yoga was packed in pouches of 2 g. For IR scanning, the samples were mixed with KBr in proportion to 1:100 ratio and press to pellet form using hydraulic pressure.<sup>[9]</sup> The spectrophotometer (Varian 640 IR) was first calibrated, and then the pellets made from the samples were scanned under the same condition.

## RESULTS AND DISCUSSION

The IR scanning spectroscopy gives spectra relating to the sample scanned [Figures 1-7]. These spectra were interpreted in the context of the studies of Chanaka Yoga and the remaining samples individually. All the samples were analyzed for variation in the functional group and bonding pattern since the final sample is the mixture of all the six ingredients. The absorption peak of each spectrum was studied for the possibility of the components.

Absorption peaks found in the case of Chanaka Yoga are 3427.85, 2927.49, 1701.92, 1519.42, 1639.11, 1336.93, 1042.66, and 665.36 which denotes the presence of hydrogen-bonded alcohol and phenols, hydrogen bonded acid, aldehydes and ketones, aromatic hydrocarbons, ketones, esters and aldehydes, alcohol and ether, alkenes and alkenes. Absorption peaks in the case of Chanaka are 3427.85, 2926.88, 1648.92, 1552.41, 1241.98, 1016.96, and 786.02. Peaks in the case of Haridra are 3747.64, 3427.86, 2925.50, 1644.21, 1544.37, 1455.26, and 1041.94. Peaks in the case of Daruharidra are found to be as 3747.64,

**Table 1: Ingredients of Chanaka yoga with the details of Sanskrit name, Botanical name, Family and part used**

Substance	Botanical name	Family	Part used
Chanaka	<i>Cicer arietinum</i> Linn	Papilionaceae; Fabaceae	Seed
Haridra	<i>Curcuma longa</i> Linn	Zingiberaceae	Rhizome
Daruharidra	<i>Berberis aristata</i> DC.	Berberidaceae	Stem
Haritaki	<i>Terminalia chebula</i> Retz.	Combretaceae	Fruit pulp
Bibhitaki	<i>Terminalia bellirica</i> Roxb	Combretaceae	Fruit Pulp
Amalaki	<i>Emblica officinalis</i> Gaerth	Euphorbiaceae	Fruit pulp

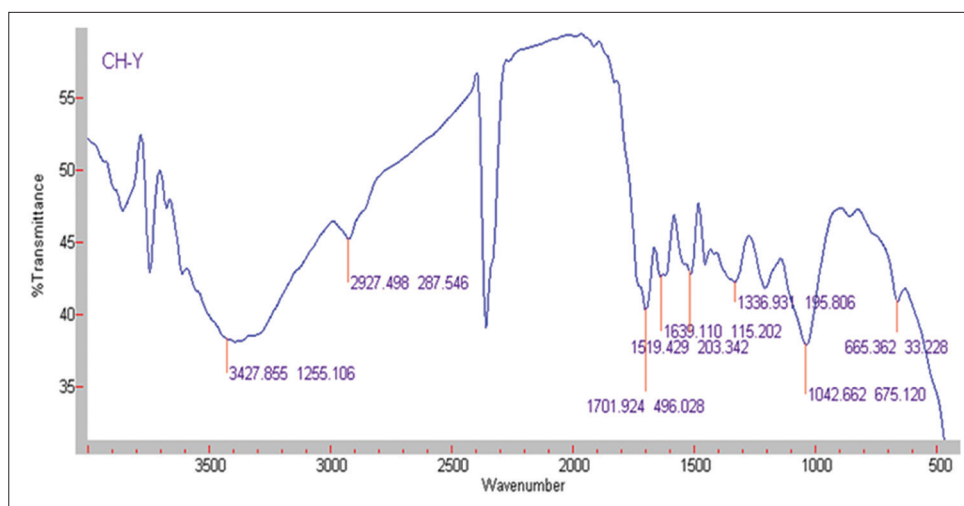


Figure 1: FTIR spectra of Chanaka yoga

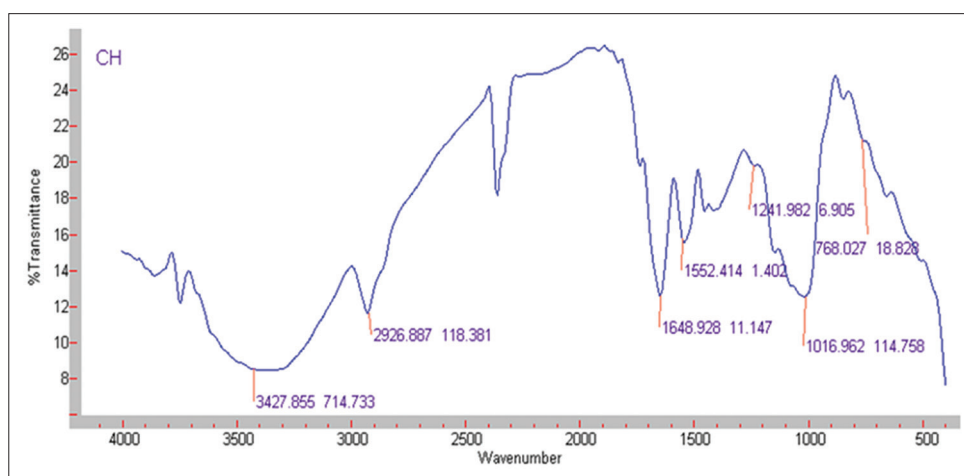


Figure 2: FTIR spectra of Chanaka

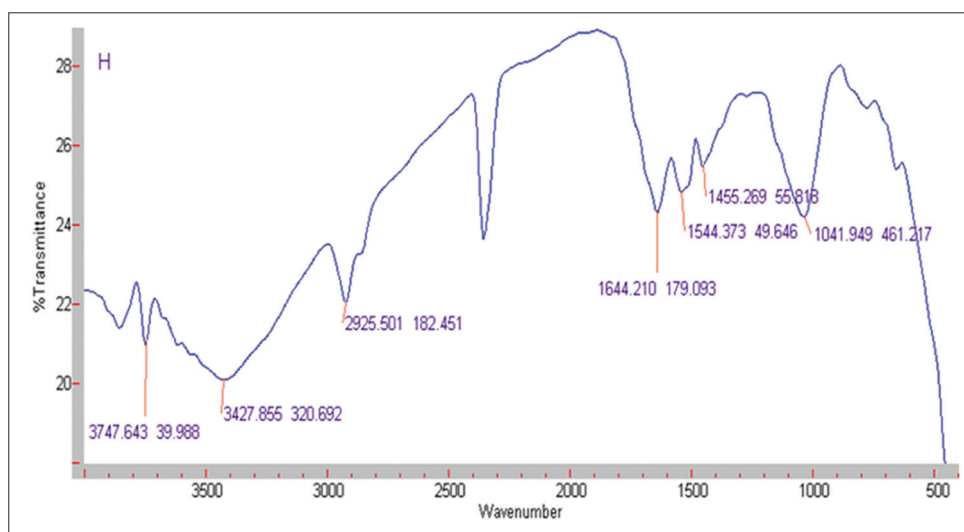


Figure 3: FTIR spectra of Haridra

3427.86, 2926.08, 1630.96, 1458.456, 1237.79, and 1047.53. Absorption peaks in the case of bibhitaki are 3427.85, 2928.084, 1708.61, 1625.69, 1423.81, 1214.71,

and 1042.06. Peaks in the case of amalaki are 3427.86, 2926.43, 1730.90, 1625.69, 1425.75, 1056.41, and 663.64. The observed peaks of these components showed the similar

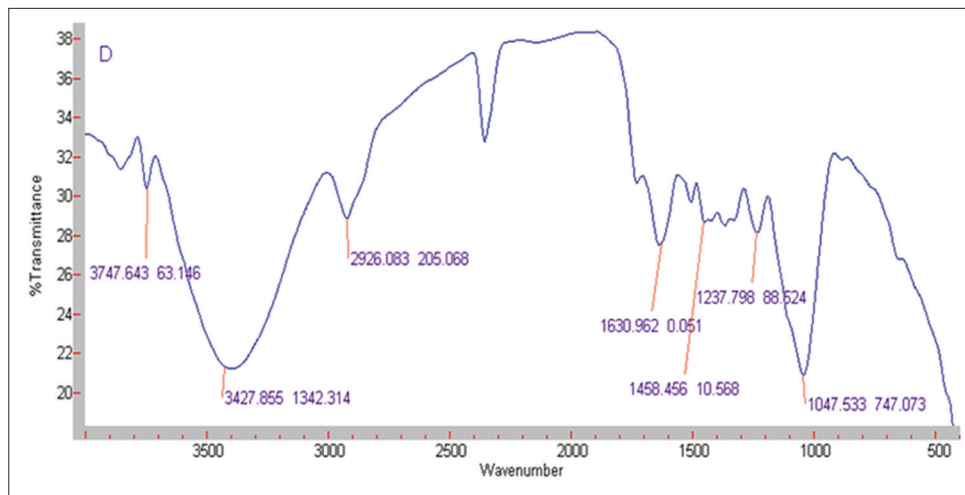


Figure 4: FTIR spectra of Daruharidra

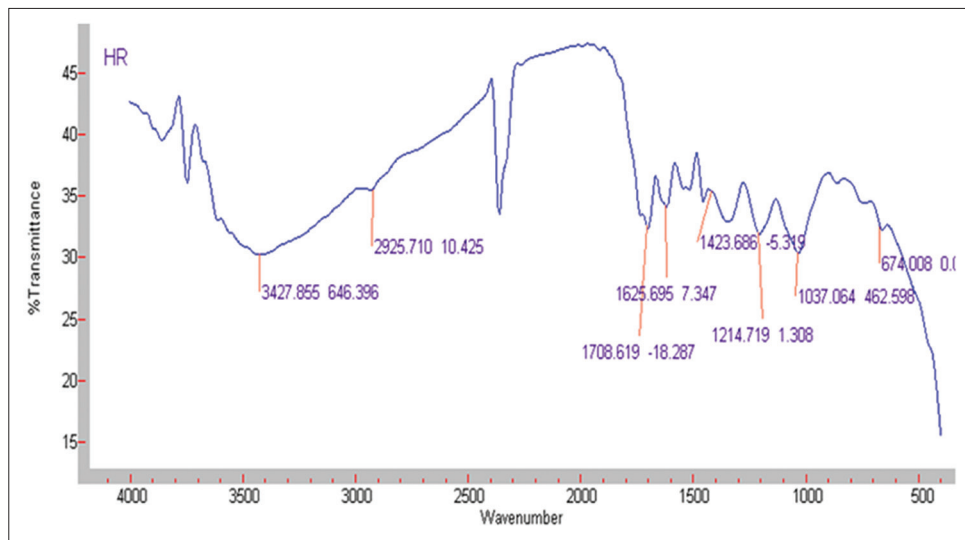


Figure 5: FTIR spectra of Haritaki

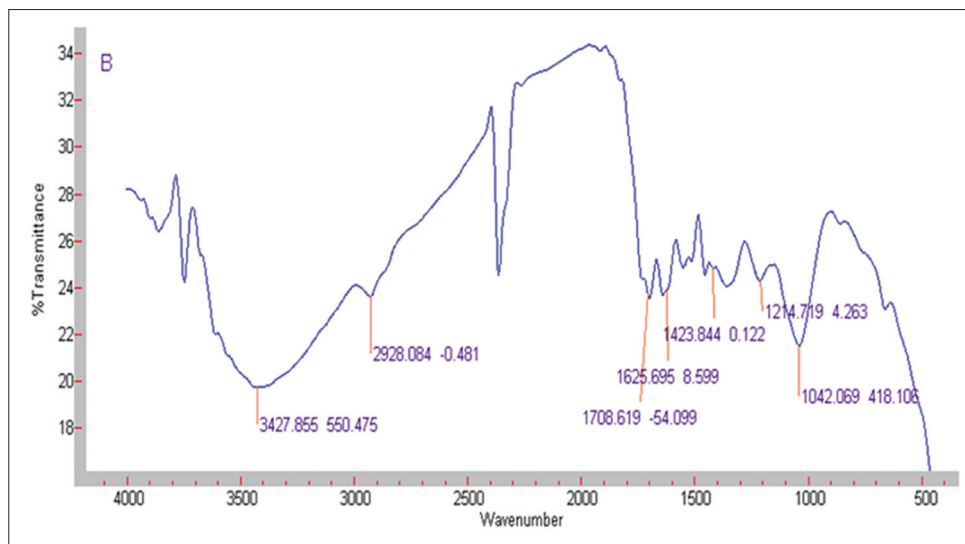


Figure 6: FTIR spectra of Bibhitaki

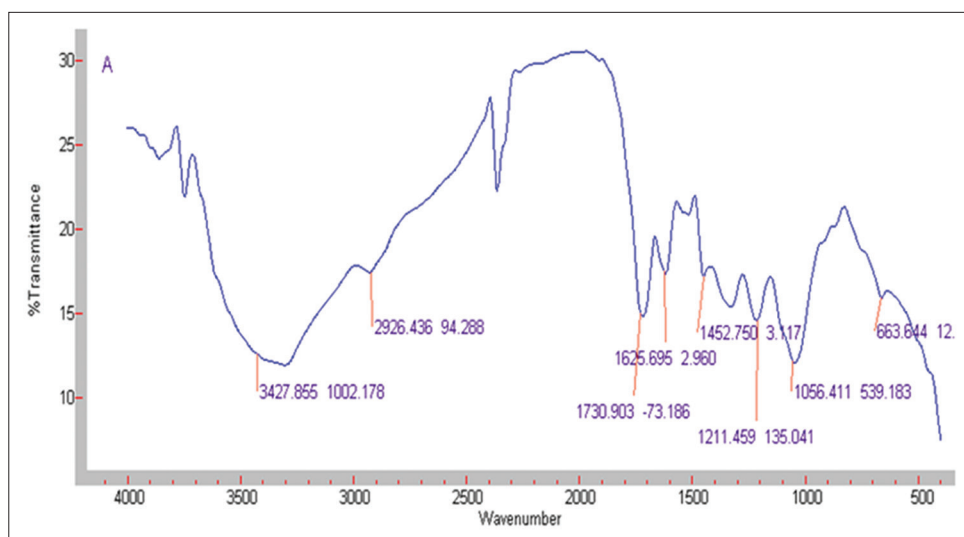


Figure 7: FTIR spectra of Amalaki

compounds as of Chanaka Yoga at an equivalent range of absorbance.

## CONCLUSION

Chanaka Yoga is the preparation of Basavarajiyam and also mentioned in Vaidya Chintamani to treat madhumeha. The chemical constituents of Chanaka Yoga and remaining ingredients were analyzed by IR scanning to identify the similarity between the absorption peaks of all the samples. IR absorption pattern shows that the possibility of chemicals found was similar in all the samples. This study will be helpful in determining the exact composition of chemical constituents in reference with the present study.

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