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Variation of Amino Acids in Some Biological and Pharmaceutical Sample FT-IR Study

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Abstract: Variation of amino acids between biological sample (Rice powder, nelli powder an lemon powder) and pharmaceutical sample (Vitamin A , Vitamin B12 and Vitamin C) has been studied using FTIR spectroscopy. Spectroscopic analyses of biological and pharmaceutical samples are discussed. It has been found that the variation in amino acids with the variation in biological and pharmaceutical samples are correlated and the present study confirms the total amino acid content is very much lower in biological samples compared to pharmaceutical sample. Also an attempt has been made to correlate the extinction co-efficient (K) values with the changes in amino acid and phenols of the biological and pharmaceutical sample. The result shows amino acid and phenol groups are more in pharmaceutical samples then biological sample.

Key word: FTIR Spectroscopy · Amino acids · Pharmaceutical sample · Biological sample

INTRODUCTION

The biological and pharmaceutical sciences may be broadly viewed to encompass a number of specialties, which differ greatly in the types of problems that are encountered and the means employed towards their solution. However, the techniques of vibrational and resonance spectroscopy have been and probably will continue to be used most widely and advantageously within hose specialties (such as biochemistry, biophysics and molecular biology) that are concerned for the most part with problems at the molecular level. The potentialities and the liabilities of FTIR spectroscopic techniques for applications in related disciplines like clinical chemistry, molecular biology, biophysics and biochemistry and the like can be realized by the large number of research paper published in the recent past [1-9].

The information provided by IR spectra to aid in the solution of problems in structural chemistry is a well-known idea. For biological sample only condensed phases a. The present study has been conducted with the objective to know the effect of pharmaceutical and biological samples. The total amino acid content of different pharmaceutical and biological samples and hence to find out whether any correlation exists between the amino acid variation of pharmaceutical and biological samples.

METHODS AND MATERIALS

The spectra are recorded at room temperature (30°C) using BRUKER IFS 66 MODEL Fourier transform infrared spectrometer. The spectra of all varieties of powdered and palletized the powder sample are recorded. The variety of vitamins (Vitamin A, Vitamin B_{12} and Vitamin C) enzymes obtained from Pharmaceutical Department, J.S.S.Pharmaceutical College at Mysore. The biological sample (rice powder, nelli powder and lemon powder) obtained from microbiological department, Mysore University, the samples are powdered well and dried at 110°C for four hour to remove the moisture content. Then samples are ground well into a fine powder by using an agate mortar. The spectra of the sample are recorded using KBr pellet technique in the range 4000 - 400 cm^{-1}.

RESULT AND DISCUSSION

Pharmaceutical samples like vitamin A, vitamin B_{12} and Vitamin C and biological sample like rice powder, nelli powder and lemon powder are taken up for the present investigation. Their mineral as well as organics constituents are analyzed spectroscopically with special reference to the amino acid and phenyl compounds.

FTIR spectra of the sample exhibit the absorption bands of chromophoric group characteristic of phenols, amino acids, proteins and chlorophylls. From the

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quantitative analysis of these organic constituents, it is found that the levels of the phenols and amino acids are more are less equal pharmaceutical and biological samples.

The strong absorption at 1653cm^{-1} an weak absorption at 1539cm^{-1} coupled with the presence of band at 3292 cm^{-1} may be taken as an indication of the presence of amino acid [1]. The presence of 1653cm^{-1} band is characteristic of amino acid group-I and the band at 1539 cm^{-1} is characteristic of amino acid group-II as given by Randal *et al*. [3] and Rao [1], where as both the group show a band at 3292cm^{-1} The band at 1653cm^{-1} , is characteristic of the substituted secondary amides, indicative of the C=O stretching [4,5]. Amide II absorption bands are also observed at 1570 - 1510 cm^{-1} [3,6]. The weak bond around 1300-1200cm^{-1} can be assigned to the mixed vibrations involving N-H bending [7,8]. The salt of nitro compounds shows the asymmetric and symmetric N-O stretching frequencies in the region 1316 - 1205 and 1175 - 1045cm^{-1} respectively.

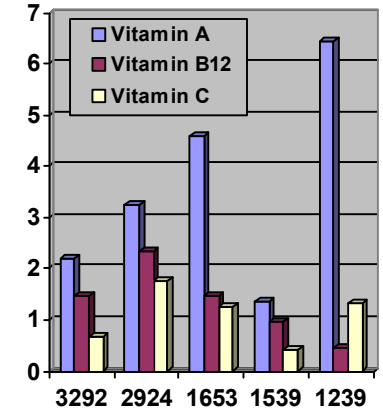
The variation in intensity are observed with respect to biological and pharmaceutical samples which may attributed to the changes in total free amino acids, esters, ethers, phenols, proteins, fat and carbohydrate contents. The presence of 3300 - 3250 cm^{-1} found in characteristic of amino acids [9-13]. The presence of 1655cm^{-1} band is characteristic of the amino acid group I and the band at 1550cm^{-1} is characteristic of amino acid group II as given by Rao [9] and Randal *et al.* [13,19,20,21]. The strong absorption band at 1750-1655cm^{-1} characteristic of C=O stretching indicates the presence of carbonyl groups [11-18].

Table 1: Value of Extinction co-efficient (K) value of Pharmaceutical sample

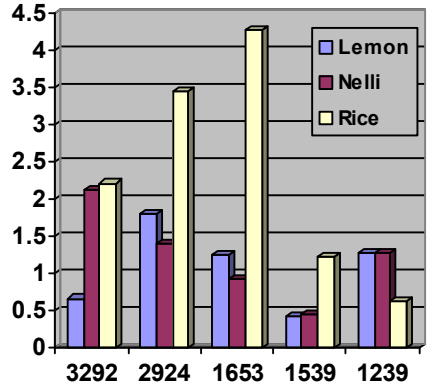
	Extinction co-efficient (K) cm^2/mg		
Absorption band cm^{-1}	Vitamin A	Vitamin B12	Vitamin C
3292	2.211	1.484	0.662
2924	3.252	2.324	1.752
1653	4.594	1.472	1.249
1539	1.343	0.9550	0.431
1239	6.431	0.4560	1.327

Table 2: Value of Extinction co-efficient (K) value of Biological sample

	Extinction co-efficient (K) cm^2/mg		
Absorption band cm^{-1}	Lemon powder	Nelli Powder	Rice Powder
3292	0.667	1.284	2.211
2924	1.802	2.132	3.452
1653	1.249	1.407	4.259
1539	0.433	0.925	1.223
1239	1.275	0.466	0.623



Variation of extinction co efficient value with Pharmaceutical sample



Variation of extinction co efficient value with Biological sample

Fig. 1:

We estimate quantitatively the amino acids due to changes in the total organic constituents in pharmaceutical samples and biological samples. For this specific extinction co-efficient (k) are calculated using the relation K= DA / m cm^2 / mg.

Where D is optical density of the absorption band log, A is the area of the pellet in cm2 and m is the mass if the samples in the pellet in mg. The values of extinction co-efficient are tabulated in Table 1and 2.

The table 1-2 shows the extinction co-efficient of the peak 3292cm^{-1}, 1653 cm^{-1} and 1539 cm^{-1} are characteristic of amino acids and phenyl groups. From Fig. 1 it is clearly indicates that the amino acids and phenyl groups are more in pharmaceutical samples. But the amino acid and phenyl group and cyclic compound sufficient values contains in natural biological sample. Since few amino acids and phenols also possess cyclic ring structures, it equally acts on them and hence the total amino acids and phenols are shows similar results.

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