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VARIATION OF AMINO ACIDS IN SOME BIOLOGICAL AND PHARMACEUTICAL SAMPLE USING FT-IR STUDY

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Abstract

Variation of bio molecules (amino acids) between biological sample (Oryza sativa powder, Phyllanthus emblica powder and Citrus limonium powder) and pharmaceutical sample (Retinol, Cyanocobalamin and Ascorbic acid) has been studied using FTIR spectroscopy. Spectroscopic analyses of biological and pharmaceutical samples are discussed. It has been found that the variation of bio molecules with the variation in biological and pharmaceutical samples are correlated and the present study confirms the total bio molecules 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 bio molecules 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 [1-5].

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 are encountered in which molecular rotation are transformed into oscillations of the molecule as a whole and can usually be neglected.

The present study has been conducted with the objective to know the total amino acid content of different pharmaceutical and biological samples. The effect of 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 (30^0C) 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, amala powder and lemon powder) obtained from Biotechnology department, Mysore University, the samples are powdered well and dried at 110^0 C for four hour to remove the moisture content. Then solid 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, amala powder and lemon powder are taken up for the present investigation. Their spectral data are presented in Table-1. 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 quantitative analysis of these organic constituents, it is found that the levels of the phenols and amino acids are more or less equal in pharmaceutical and biological samples. The strong absorption at 1653cm^{-1} a 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 [6,7]. 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 Rao[1] and Randal et al [8], 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 [9]. Amide II absorption bands is also observed at 1570 - 1510 cm^{-1} [10]. The weak bond around 1300 - 1200 cm^{-1} can be assigned to the mixed vibrations involving N-H bending [11,12]. The salt of nitro compounds shows the asymmetric and symmetric N-O stretching frequencies in the region 1316 - 1205 cm^{-1} and 1175 – 1045 cm^{-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 [13,14]. The presence of 1655cm^{-1} band is characteristic of the amino acid group I and the band at 1550 cm^{-1} is characteristic of amino acid group II as given by James et al [15]. The strong absorption band at 1750–1655 cm^{-1} characteristic of C=O stretching indicates the presence of carbonyl groups [16]. 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= $\frac{DA}{m}$ cm^2 / mg

Where D is optical density of the absorption band log $\left[\frac{I_0}{I}\right]$ and A is the area of the pellet in cm^2 and m is the mass if the samples in the pellet in mg. The values of extinction co-efficient are tabulated in Table 2 and 3.

Table 2 and 3 shows the extinction co-efficient of the peak 3292 cm^{-1}, 1653 cm^{-1} and 1539 cm^{-1} are characteristic of amino acids and phenyl groups. From Figure-1 it is clearly indicates that the extinction co-efficient of the peak 3292 cm^{-1} , 1653 cm^{-1} and 1539 cm^{-1} are the characteristic of amino acids and phenyl groups. the strong broad band amino acids at 3292 cm^{-1} has the extinction co-efficient varying from 4.594 to 2.211 cm^2 / mg and the strong band C=O / Phenyl ring amino acid – I at 1653 cm^{-1} has the extinction co-efficient varying from 1.24 to 4.59 cm^2 / mg. The amino acids and phenyl groups are more in pharmaceutical samples then the biological 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.

Conclusion

From the above study it is concluded that the pharmaceutical samples and biological sample exhibited to find the variation of amino acids and phenyl group. The extinction co-efficient of the peak 3292 cm^{-1}, 1653 cm^{-1} and 1539 cm^{-1} are the characteristic of amino acids and phenyl groups. From our investigation it is pointed out that biological and pharmaceutical samples contain similar results of amino acids and phenyl groups.

Table-1: FTIR Spectral Data of absorption frequencies for different samples.

Samples	***Absorption frequency*** (cm^{-1})								
Retinol	3526	3410	3260	1754	1673	1321	1150	1121	756
Cyanocoba-lamin	3247	2925	2854	1745	1537	1456	1160	1079	721
Ascorbic acid	3360	2929	2854	1730	1630	1400	1150	1029	704
Oryza sativa	3274	2926	2855	1745	1655	1460	1239	1041	618
Amala	3296	2925	2854	1746	1653	1544	1239	1158	1077
Citrus limonium	3313	2925	2855	1745	1655	1541	1160	1078	721

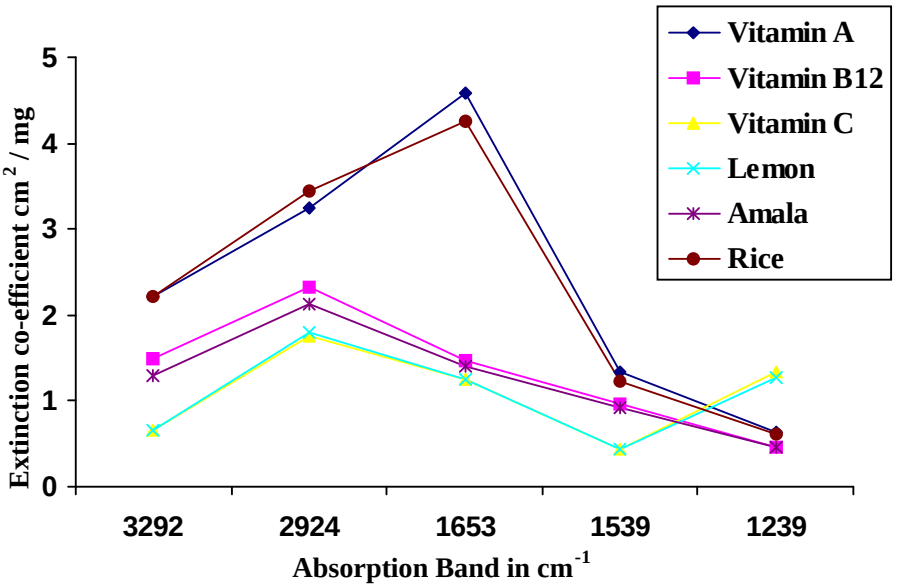
Table–2: Value of Extinction co-efficient (K) value of Pharmaceutical sample.

Absorption band cm^{-1}	Extinction co-efficient (K) cm^2/mg		
	Vitamin A	Vitamin B_{12}	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	0.643	0.4560	1.327

Table-3: Value of Extinction co-efficient (K) value of Biological sample.

Absorption band cm^{-1}	Extinction co-efficient (K) cm^2/mg		
	Lemon powder	Amala 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

Figure - 1 : Extinction co-efficient values of Pharmaceutical Samples and Biological Samples



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