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Interactions between Flavonoids and Human Serum Albumin

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ABSTRACT

In this paper, the binding of flavonoids (Quercetin and Naringin) to Human Serum Albumin (HSA) have been investigated by FTIR technique. The results have been discussed in detailed. The effects of human serum albumin on the binding of Quercetin and Naringin were also studied. The differences of the structure characteristics have a significant effect on their binding affinity for HSA.

Keywords: Quercetin, Naringin, Human Serum Albumin, FTIR.

I. INTRODUCTION

Polyphenol are secondary plant metabolites and have received more attention because of their potential health benefits [1-3]. Flavonoids, regulate constituents of the diet, were first identified as vitamin P, and along with vitamin C were found to be important in the maintenance of capillary wall integrity and capillary resistance. They respond to light and are known to control the level of auxins, the regulators of plant growth and differentiation.

Consumption of plant and plant products that are rich in flavonoids, such as cocoa, wine, tea, and berries has been related with protective effects against cardiovascular disease and certain forms of cancer [4, 5].

Current knowledge suggests that factors such as protein binding may impair polyphenol absorption and bioavailability and even mask their antioxidant activity [6, 7]. Protein-polyphenol association is a well-known phenomenon; however, it is only relatively that any considerable information has been obtained in the area of how the structure of either the protein or the polyphenol may affect the interaction. In this paper, we study the association of flavonoids with Human serum albumin.

II. MATERIALS AND METHODS

Human serum albumin, Quercetin and Naringin were purchased from Sigma-Aldrich Company Bangalore, and were used without further purification. FTIR spectra were recorded on a JASCO FTIR spectrometer (Japan, Tokyo), equipped with a liquid-nitrogen-cooled HgCdTe (MCT) detector and a KBr beam splitter.

III. RESULTS AND DISCUSSION

The recorded FTIR spectra of HSA without and with the two flavonoids (i) Quercetin and (ii) Naringin are given in figures. FTIR spectra of Human serum albumin (HSA), Quercetin and Naringin are given in figures 1, 2 and 3 respectively. The complexes of (HSA + Quercetin) and (HSA + Naringin) are shown in figures 4 & 5 respectively. Differences in peak intensities of HSA before and after complex formation have been presented in Tables 1 & 2, along with their tentative assignments.

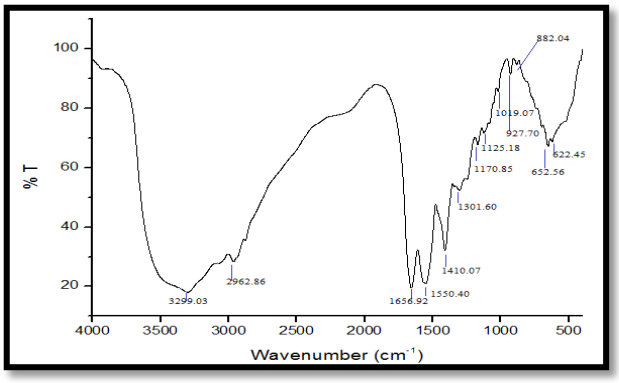

Figure 1. FTIR Spectra of Human Serum Albumin

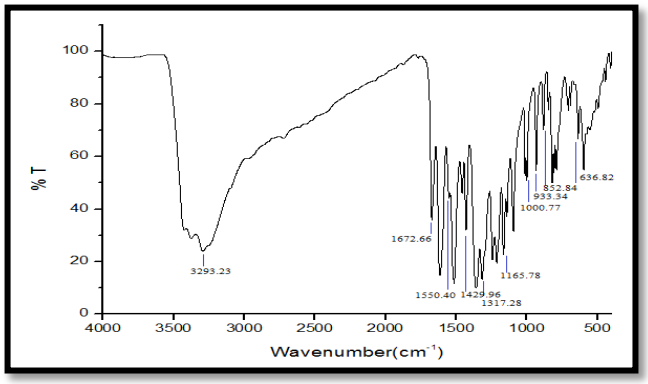

Figure 2. FTIR Spectra of Quercetin

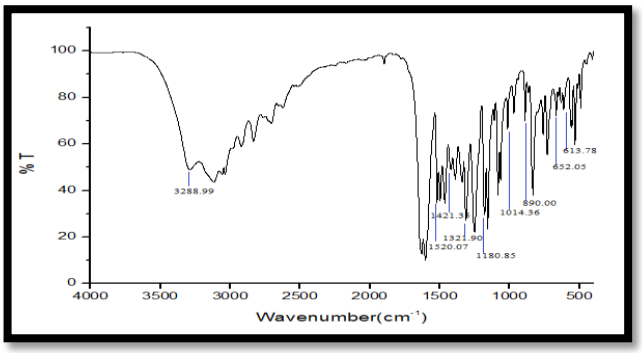

Figure 3. FTIR Spectra of Naringin

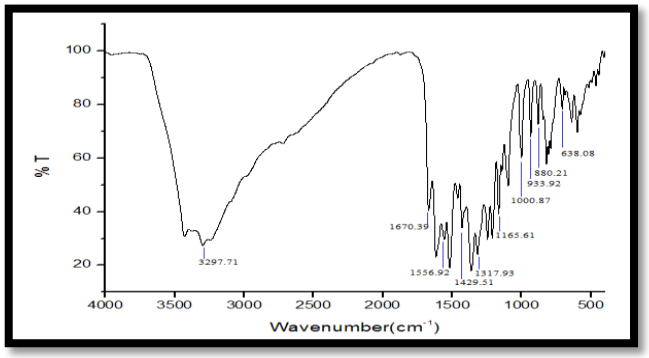

Figure 4. FTIR Spectra of Human Serum Albumin + Quercetin

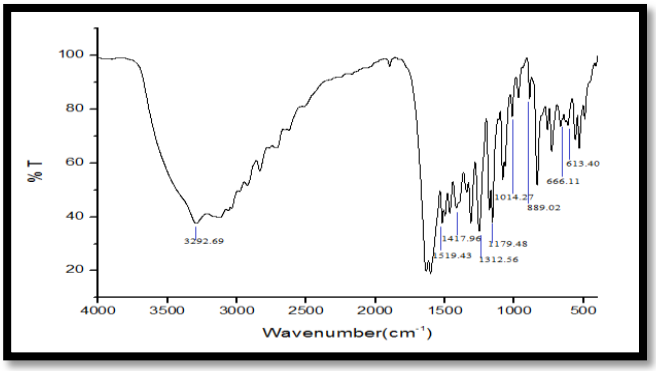

Figure 5. FTIR Spectra of Human Serum Albumin + Naringin

Table 1. Difference in FTIR absorption peak intensities of Human Serum Albumin (HSA) before and after complex formation

Intensities (cm^{-1})			Difference in intensities prior to and after %	Tentative assignment
HSA	Q	HSA + Q		
3299.03	3293.23	3297.71	5.42	Alkynyl C-H stretching
1656.92	1672.66	1670.39	8.07	C=O stretching
1550.40	1550.40	1556.92	0.32	Aromatic C=C bending
1410.07	1429.96	1429.51	2.47	CH_2 bending vibrations
1301.60	1317.28	1317.93	32.33	Protein ring structure
1170.85	1165.78	1165.61	39.59	C=C Stretching
1019.07	1012.73	1000.87	11.63	C-O Stretching
927.7	933.34	933.92	28.55	-CH=CH_2 Stretching
882.04	882.84	880.21	20.23	C=CH_2 Stretching
622.45	636.82	638.08	4.86	-CH=CH-(cis) Stretching

Table 2. Difference in FTIR absorption peak intensities of Human Serum Albumin (HSA) before and after complex formation

Intensities (cm^{-1})			Difference in intensities prior to and after %	Tentative assignment
HSA	**N**	**HSA + N**		
3299.03	3288.99	3292.69	15.68	Alkynyl C-H stretching
1550.40	1520.07	1519.43	8.34	Aromatic C=C bending
1410.07	1421.35	1417.96	6.68	CH_2 bending vibrations
1301.60	1312.90	1312.56	18.74	Protein ring structure
1170.85	1180.85	1179.48	36.02	C=C Stretching
1019.07	1014.36	1014.27	5.3	C-O Stretching
882.04	890.00	889.02	8.84	$C=CH_2$ Stretching
652.56	652.05	666.11	5.53	-CH=CH-(cis) Stretching
622.45	613.78	613.40	5.6	-CH=CH-(cis) Stretching

Alkynyl C-H stretching has been observed at $3297\pm10cm^{-1}$. C=O stretching was obtained at $1656\pm25cm^{-1}$. Aromatic C=C bending was noted at $1550\pm10cm^{-1}$. CH_2 bending vibrations were assigned in the region of $1410\pm30\ cm^{-1}$. Protein ring structure was observed at $1300\pm20cm^{-1}$. $–CH=CH_2$ stretching was noticed at $927\pm15cm^{-1}$. $C=CH_2$ stretching was observed at $880\pm10cm^{-1}$. –CH-CH-(cis) stretching has been obtained at $620\pm20cm^{-1}$.

IV. CONCLUSION

In this paper the binding properties of two flavonoids (Quercetin and Naringin) to HSA were characterized by FTIR technique. The results indicated a conformation change of HSA with addition of flavonoids. However, the difference of structure characteristics appears to have a significant effect on their incorporation amount.

V. REFERENCES

[1]. C.Y. Zhao, Y.M. Shi,W.F.Wang, Z.J. Jia, S.D. Yao, B.T. Fan, R.L. Zheng, Biochem. Pharmacol. 65 (2003) 1967-1971.

[2]. L.R.C. Barclay, K.A. Baskin, S.J. Locke, T.D. Schaefer, Can. J. Chem. 65 (1987) 2529-2540.

[3]. K.E. Heim, A.R. Tagliaferro, D.J. Bobilya, J. Nutr. Biochem. 13 (2002) 572-584.

[4]. I.F. Cheng, K. Breen, Biometals 13 (2000) 77-83.

[5]. B.H. Havsteen, Pharmacol. Therapeut. 96 (2002) 67-202.

[6]. B. Sengupta, P.K. Sengupta, Biochem. Biophys. Res. Commun. 299 (2002) 400-403.

[7]. M.J.T.J. Arts, G.R.M.M. Haenen, L.C. Wilms, S.A.J.N. Beetstra, C.G.M. Heijnen, H.P. Voss, A. Bast, J. Agric. Food Chem. 50 (2002) 1184-1187.