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FTIR SPECTROSCOPIC STUDIES ON LATEX OF *PLUMERIA RUBRA*- COMPARATIVE ANALYSIS OF FUNCTIONAL GROUP AFTER EXTRACTION

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ABSTRACT

FT-IR spectra of *Plumeria rubra* latex were recorded and from the absorption spectra, the frequency spectrum and intensities were collected. The result shows that both the samples after extraction are abundant in certain constituents. During the study period, the various frequency levels and their functional groups were studied. The results have shown that the biomolecules were rich in the methanolic sample as compared to aqueous sample.

KEYWORDS: FTIR spectra, *Plumeria rubra*, functional groups.

1. INTRODUCTION

The use of IR spectroscopy to examine biological samples was first proposed in the 1940s to effectively investigate the method for the study of biological materials and infection. It has been shown that FT-IR spectroscopy is a powerful technique for researching biological macromolecules and complex biological structures such as tissues and cells.[4] The Fourier Transform Infrared Radiation (FT-IR) spectrometer is a standard analytical tool.[7] Many common biomolecules, such as nucleic acids, proteins, lipids and carbohydrates have been identified and known vibrational fingerprints have been analysed by IR spectroscopy, leading to several important and extensive biological sample investigations.[4] FT-IR usually identifies the different functional groups present in the samples. It assists with many approaches in structuring elucidation and has acquired significance in defining drugs of several countries.[2] No research till date has been done on the latex of Plumeria rubra using FT-IR. So, based on the literature review an attempt was made to investigate the functional groups present in latex by FT-IR methods.

Taxonomical Details

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperm C
lade: Eudicots
Clade: Asterids
Order: Gentianales
Family: Apocynaceae
Genus: *Plumeria*
Species: *rubra*.

Fig. 1: Plant of *Plumeria rubra*.

2. MATERIALS AND METHODS

2.1 Collection and preparation of extract

The latex of *Plumeria rubra* was collected in the month of November and December from the area near Gujarat University, Ahmedabad, Gujarat, India. The collection and preparation of the latex extracts was made according to the standard protocol of R. M. Aliyu.[9] The extracts were stored in refrigerator until used. Two solvent systems were chosen- aqueous and methanol. These were further subjected to FTIR analysis.

FTIR Spectroscopic analysis

For Apodization, Happ-Genzel function has been used here. The extracts were scanned between 650-2000cm^{-1} spectral range and were recorded at room temperature on a Agilent Cary 630 FT-IR spectrometer. and the characteristic peaks were detected. The peak values of the FTIR were recorded.

3. RESULTS AND DISCUSSION

FT-IR spectra analysis of the methanolic and aqueous extracts of *P. rubra* latex showed the existence of various functional groups (Table 1).

Table 1: FTIR spectral ranges and functional groups obtained for the latex extract (in different solvents) of *P. rubra* by comparing with various research works.[1,3,5,6,8,10,11]

Extracts prepared in	Ranges (cm-^{1})	Functional groups
Methanolic	1500-1400 cm^{-1}	N-H stretching vibration- presence of primary, secondary amines, C=C-C asymmetric stretching vibration- presence of aromatic rings, N=O stretching vibration- presence of nitro groups, C-C stretching vibration- presence of aromatics, C-H bend stretching vibration presence of alkenes
	1200-1100 cm^{-1}	C-H stretching vibration- presence of alkyl halides, C-N stretching vibration- presence of aliphatic amines,
		C-O stretching vibration- presence of esters and ethers, O-H stretching vibration- presence of carbohydrate
	1100-1000 cm^{-1}	C-N stretching vibration- presence of aliphatic amines, C-O stretching vibration- presence of esters, ethers, anthraquinones and alcoholic groups, O-H stretching vibration- presence of carbohydrate, CO-O-CO stretching vibration- presence of anhydride, C-CO-C stretching vibration- presence of carbonyl compounds and ketones, C-CHO bend stretching vibration- presence of aldehyde, C-F stretching vibration- presence of fluoride, O-H bend stretching vibration- presence of hydroxyl group
Aqueous	1700-1600 cm^{-1}	N-H bend stretching vibration- presence of primary, secondary amines,
		C=C-C symmetric stretching vibration- presence of alkenes, C=O stretching vibration- presence of aldehydes, ketones, proteins and

		coumarin glycosides, H bonded OH stretch, C=O stretch OH bend stretching vibration- presence of carboxylic acid, -C=C- stretching vibration- presence of terpenes
	700-600 cm^{-1}	N-H stretching vibration- presence of primary, secondary amines, C-Br stretching vibration- presence of halo compounds C-H stretching vibration- presence of aromatics

Below the spectra results are shown in Figure 2 and 3, where the peaks between 1500-1400 cm^{-1}, 1200-1100 cm^{-1} and 1100-1000 cm^{-1} were observed in the methanolic extract and peaks between 1700-1600 cm^{-1} and 700-600 cm^{-1} were observed in aqueous extract of the latex respectively.

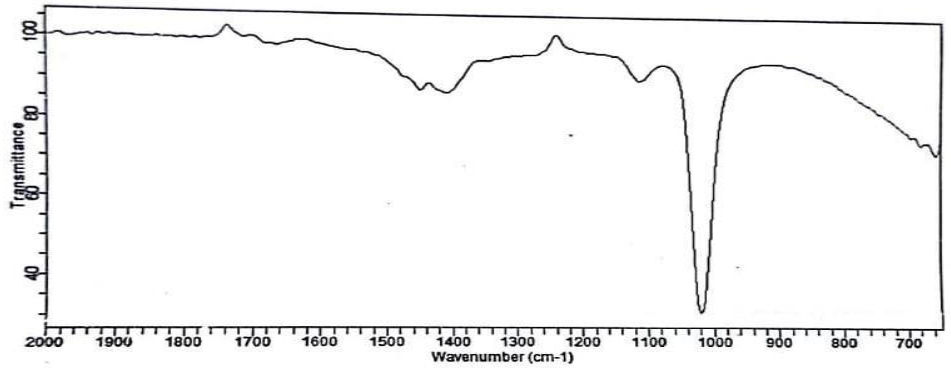

Fig. 2: FTIR of methanolic extract of *P. rubra.*

In the methanolic extract the observed bands appearing between the range 1400-1500 cm^{-1} indicate the presence of N-H stretch for amines, C=C-C asymmetric stretch for aromatic rings, N=O stretch for nitro groups, C-C stretch for aromatics and C-H bend stretching for alkenes. The observed absorption band between the range 1100-1200 cm^{-1} indicates the presence C-H for alkyl halides, C-N stretch for aliphatic amines, C-O stretch for esters and ethers and O-H stretch for carbohydrate. The very strong absorption band observed between the 1000 – 1100 cm^{-1} may be due to the presence of C-N stretch for aliphatic amines, C-O stretch for esters and ethers, anthraquinones and alcoholic group, O-H stretch for carbohydrate, CO-O-CO stretching for anhydride, C-CO-C stretching for carbonyl compounds, C-CHO bending for aldehyde, C-CO-C stretching for ketone, C-F stretch for fluoride and O-H bending for hydroxyl group.

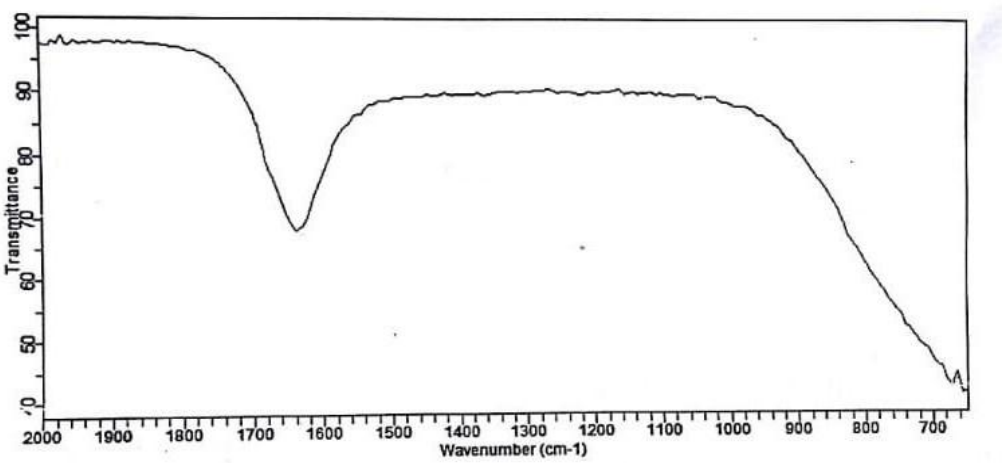

Fig. 2: FTIR of aqueous extract of *P. rubra.*

In aqueous extract the very strong absorption band was observed between the range 1600 – 1700 cm^{-1} reveals the presence of various functional groups like N-H stretch and N-H bend for amines, C=C-C symmetric stretch for

alkenes, C=O stretch for aldehydes, proteins, coumarin glycosides and ketones, H bonded OH stretch, C=O stretch OH bend for carboxylic acids and -C=C- stretch for terpenes. The band appearing between the range 650-700 cm^{-1} indicates the presence of N-H bend for amines, C-Br for alkyl halides (halo compounds) and C-H bend for aromatics.

4. CONCLUSION

We explored the ability of FT-IR spectroscopy in this analysis for simple and rapid classification and the detection of functional groups which are finally responsible for medicinal properties present in the plant. The spectral region varying from 650-2000 cm^{-1} could be considered an important field for simple and accurate determination of all the possible biomolecules present in the samples. The different frequency ranges and their functional groups analysed during the study period showed that the biomolecules were abundant in the methanolic sample in comparison to the aqueous sample.

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