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FTIR AND UV-VIS SPECTROSCOPIC STUDIES ON *FERONIA LIMONIA LEAVES*

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ABSTRACT:

The present study was aimed to produce the UV-VIS and FTIR spectrum profile of *feronia limonia.*The extracts were examined under visible and UV light for the proximate analysis. The crude extracts of *feronia limonia* were scanned in the wavelength ranging from 190-1100 nm by using Elico Double beam photometer model No. SL. 210 and the characteristic peaks were detected. FTIR method was performed on a Perkin Elmer Spectrophotometer system, which was used to detect the characteristic peak values and their functional groups. UV-visible spectral analysis of *feronia limonia* in aqueous extract shows six peaks and maximum absorbance is 5.88 at λ_{max} 208. Ethanolic extract shows ten peaks and maximum absorbance is 4.59. Chloroform extract shows only four peaks and λ_{max} at 240 nm. Acetone extract shows fourteen peaks and λ_{max} at 611nm. Whereas petroleum ether extract indicates five peaks and its λ_{max} at 217nm.Therefore each solvent extract different compounds. The FTIR spectrum was used to identify the functional group of the bioactive components based on different peak values in the region of infrared radiation. The results of the present study confirms the presence of aliphatic ethers, alkanes, aryl aldehyde, aliphatic nitro compound, alkenes, sulfur compound, aliphatic esters, monosubstituted alkenes, aldehydes, carboxylic acids, epoxides, alcohols, alkenyl , benzene ring, aliphatic nitro compounds, halogen compound in *feronia limonia.* The results of the present study produced the UV-VIS and FTIR spectrum profile for the medicinally important plant *feronia limonia* and also used to identify the plant in the pharmaceutical industry.

Keywords: *Feronia limonia*, UV-VIS, FTIR, Spectrophotometer.

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INTRODUCTION:

Medicinal plants are the richest bioresource of drugs for traditional systems of medicine, therefore man has been using plant extracts to protect himself against several diseases and also to improve his health and life-style. The different phytoconstituents present in medicinal plants such as flavonoid, alkaloid, phenol and tannins, carboxylic acids, terpenes and amino acids and inorganic acids. These phytoconstituents present specific distinctiveness and properties to plant[1]. Therefore, the analysis of these chemical constituents would help in determining various biological activities of plants. A variety of techniques can be used to determine and estimate the presences of such phytocontituents in medicinal plants. Chromatography and spectroscopic techniques are the most useful and popular tools used for this purpose. The Fourier Transform Infrared (FTIR) spectroscopy allows the analysis of a relevant amount of compositional and structural information in plants. Moreover, FTIR spectroscopy is an established time-saving method to characterise and identified functional groups [2]. Ultraviolet-visible spectrophotometry (UV-Vis) related to the spectroscopy of photons in the UV-visible region. UV-visible spectroscopy uses light in the visible ranges or its adjacent ranges. The colour of the chemicals involved is directly affects the absorption in the visible ranges. Molecules undergo electronic transitions in these ranges of the electromagnetic spectrum [3].

Feromia limonia belongs to family *Rutaceae*, is commonly known as kaith or wood apple and is widely distriduted in most tropical and subtropical countries[4]. The *feronia limonia* is native and comman in India, Shrilanka, China and Indonesia [5]. *Feronia limonia* as a whole or its parts such as unriped fruit, riped fruit, root bark, trunk, gum and leaves have a broad spectrum of traditionally established therapeutic properties[6] and widely used in several Ayurvedic preparation like panch kapittha[7] and kapitthaashtaka churna [8]. Leaves of *feronia limonia* showed anthelminitic activity [9]. The main chemical constituent of *feronia limonia* were flavonoids, saponins and tannin[10-13]. With this knowledge, the present research work was aimed to produce the UV-VIS and FTIR spectrum profile of *feronia limonia* plant extract.

MATERIALS AND METHODS:

Collection and preparation of plant material:

The fresh leaves of *Feronia limonia*, are collected from Mahadeo dara, District Beed. The fresh leaves were dried under shade, powdered and pass through 40 mesh sieve and stored in closed bottle for further use. The powder was extracted with different solvent such as water, ethanol, chloroform, acetone, petroleum ether by Soxhlet apparatus.

Spectroscopic analysis:

To detect the UV-VIS spectrum profile of the extracts of *feronia limonia* plant, the extract were scanned in the wavelength ranging from 190-1100nm by using Elico Double beam photometer model No. SL. 210 and the characteristic peaks were detected. FTIR analysis was performed using Perkin Elmer spectrophotometer system which was used to detect the characteristic peaks and their functional groups. The

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peaks values of the UV-VIS and FTIR were recorded.

RESULTS AND DISCUSSION:

The qualitative UV-VIS profile of aqueous extract of *feronia limonia* was taken at the wavelength of 190 nm to 1100 nm due to the sharpness of the peaks and proper baseline. UV-visible spectral analysis of *feronia limonia* in aqueous extract shows six peaks and maximum absorbance is 5.88at λ_{max} 208. Ethanolic extract shows ten peaks and maximum absorbance is 4.59. Chloroform extract shows only four peaks and λ_{max} at 240 nm. Acetone extract shows fourteen peaks and λ_{max} at 611nm. Whereas petroleum ether extract indicates five peaks and its λ_{max} at 217nm.Therefore each solvent extract have different compounds [Table.1& Fig.1.1- fig 1.5].

In the aqueous extract of *Feromia limonia* consists of characteristics peak of 2929 cm^{-1} due to C-H stretching associated with aromatic ring. The bands at 1590 cm^{-1} &1392 cm^{-1} due to asymmetric and symmetrical stretching of -NO group respectively. The peak at 3276 cm^{-1} & 2929 cm^{-1} is due to N-H stretching and C-H stretching of alkyl group respectively.

In ethanolic extract the peak at 3340 cm^{-1} and 2849 cm^{-1} are due to O-H stretching , C-H stretching of –CHO group. The peaks at 2917 cm^{-1} & 1710 cm^{-1} are due to C-H stretching and C=O stretching. The band found at 1231 cm^{-1} due to C-O-C asymmetric stretching of aromatic ether. The band at 1461 cm^{-1} confirmed presence of benzene ring. The chloroform extract of *feromia limonia* shows characteristic peak at 3300 cm ¹ due to C-H group. The peaks at 2917 cm^{-1} & 1711 cm^{-1} due to C-H stretching and C=O stretching. The peak obtained at 1375 cm^{-1} due to -NO group. The band obtained at 1061 cm^{-1} is due to C-O stretching. Acetone extract shows characteristics peak at 2916 cm^{-1} & 1462 cm^{-1} due to C-H stretching of aromatic benzene ring. 2848 cm^{-1} & 1709 cm^{-1} due to Ar-H and C=O group. The band at 1376 cm^{-1} & 719 cm^{-1} due to -NO group and C-Cl mono substituted benzene ring. Petroleum ether extracts shows presence of C-H stretching and C-O stretching due to 2916 cm^{-1} and 1710 cm^{-1}. The peak found at 719 cm^{-1} and 729 cm^{-1} due to C-Cl stretching (Table-2 and fig-2.1-2.5).

Table.1. Absorption peaks in UV-Visible range of *Feronia limonia* Different extracts.:

Sr. No.	Aqueous extract		Ethanol extract		Chloroform extract		Acetone extract		Petroleum ether extract	
	λ (nm)	O.D	λ (nm)	O.D	λ (nm)	O.D	λ (nm)	O.D	λ (nm)	O.D
1	208	5.88	229	4.59	240	6.49	611	4.70	217	4.94
2	211	5.67	226	4.47	692	4.07	332	4.59	228	4.28
3	212	5.58	222	4.07	592	5.03	609	4.53	667	4.04
4	216	5.21	209	4.07	247	4.71	680	4.52	209	3.87

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5	219	4.93	675	4.04	-	-	669	4.44	470	3.35
6	220	4.85	211	3.93	-	-	334	4.41	-	-
7	377	4.07	442	3.03	-	-	666	3.84	-	-
8	-	-	-	-	-	-	335	4.35	-	-

Table.2. IR Peak value of *Feronia limonia* for different extract.

Sr. No.	Extracts	I R Observed peaks (cm^{-1})
1	Water	3276 , 2929, 1590, 1392, 1258, 1074
2	Ethanol	3340, 2917,2840, 1710, 1614, 1514, 1375, 1461, 1231, 1047
3	Chloroform	3300,2917, 2849, 1711, 1607, 1375, 1242, 1061
4	Acetone	2916, 2848, 1709, 1462, 1376, 1083, 983, 719.
5	Petroleum ether	2916, 2848, 1710, 1462, 1376, 1082, 983, 729, 719.

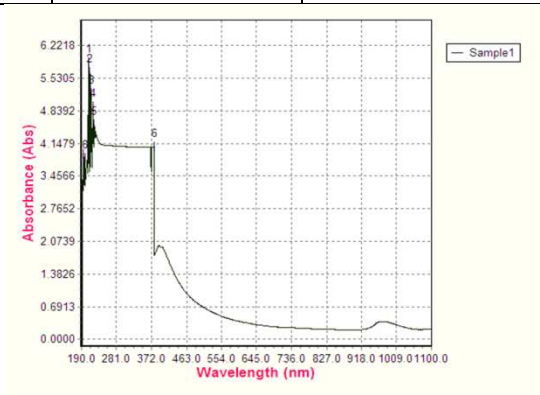

Fig.1.1. UV of *Feronia limonia* in water extract.

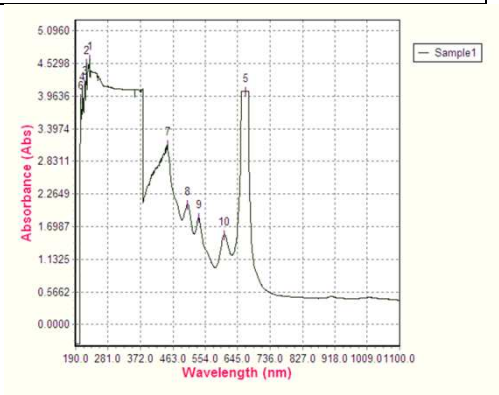

Fig.1.2. UV of *Feronia limonia* in ethanol extract.

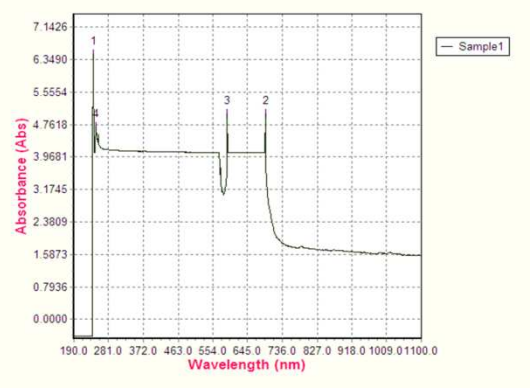

Fig.1.3. UV of *Feronia limonia* in chloroform extract

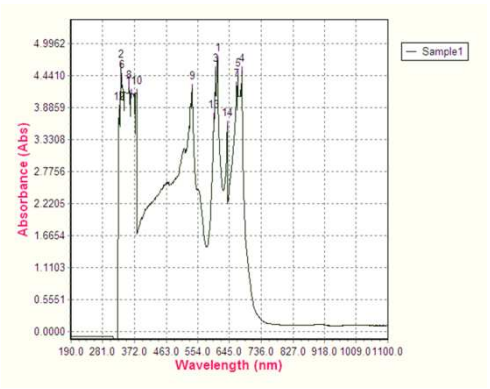

Fig.1.4. UV of *Feronia limonia* in acetone extract.

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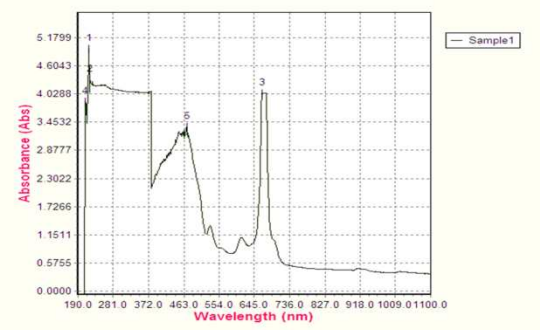

Fig.1.5. UV of *Feronia limonia* in petroleum ether extract.

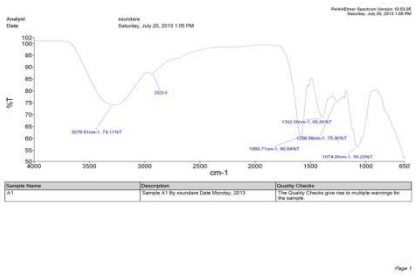

Fig .2.1 FTI R of *Feronia limonia* in aqueous extract

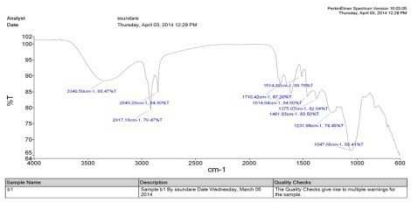

Fig. 2.2. FTI R of *Feronia limonia* in ethanol extract

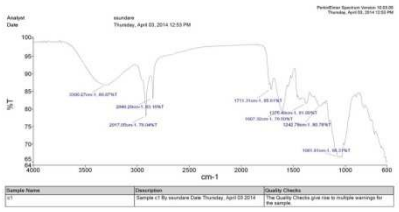

Fig. 2.3. FTI R of *Feronia limonia* in chloroform extract.

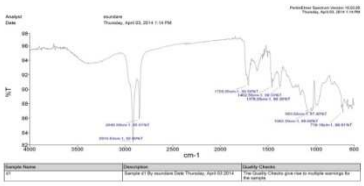

Fig. 2.4. FT I R of *Feronia limonia* in acetone extract.

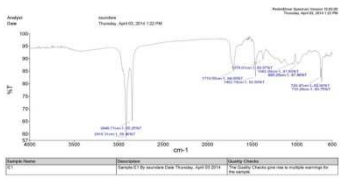

Fig. 2.5. FT I R of *Feronia limonia* in petroleum ether extract.

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