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(RESEARCH ARTICLE)

Spectroscopic profiling of *Eclipta prostrata* ethanolic leaf extract by UV & FT-IR

Banu Shirin Akhter [1], Aziz Shahin [2,*], Farhana Sharika [1] and Al-Reza Md Sharif [1]

[1] *Department of Applied Chemistry and Chemical Engineering, Islamic University, Kushtia 7003, Bangladesh.*
[2] *Senior Scientific Officer, Chemical Research Division, BCSIR Laboratories, Dhaka-1000, Bangladesh Council of Scientific and Industrial Research, Dhaka, Bangladesh.*

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Abstract

Eclipta prostrata is a significant medicinal plant which is commonly known as "Keshoraj" in Bangladesh. The present study deals with spectroscopic analysis of ethanolic extract of leaf by UV and FT-IR of this plant. The UV and FT-IR spectrum shows the presence of carbonyl group (ketone), amide, aromatic nature of compounds, sulfur compounds, nitro compounds, non-conjugated diene, gem distributed, 1°, 2° amines, anthracene and flavones, fistein, quercetin, NaQSA [Sodium Salts of Quercetin 5' Sulfonic Acid], myricetin, anthocyanin types of flavonoids. The above mention bioactive compounds are mainly contributed in medicinal utilities of the plant.

Keywords: *Eclipta prostrata* leaf; UV spectroscopy; FT-IR spectroscopy; Flavonoids

1. Introduction

Medicinal plants exhibit a wide range of biological properties for combating human diseases. A large number of medicinal plants were utilized all over the world for prevention and treatments of diseases [1]. Moreover, plant-based medicines also have an enormous potential to provide low cost, easily accessible, and safe method of treatment [2-3]. Some researchers documented medicinal properties of some plants [4-6]. However, a large number of plant species remain to be screened for their therapeutic potential; therefore, they can be used as a continuous source of new medicines for present and future health problems of humans.

Eclipta prostrata (L.) (Family: Asteraceae) (*E. prostrata*) is popularly known as "Keshoraj/King of hairs" used in indigenous system of medicine as a hepatoprotective drug. It is a creeping and moisture loving herb commonly distributed on roadsides and wastelands throughout tropical areas especially in Asia. *Eclipta* is a small annual herb whose stem is usually erect, flat or round, blackish green, profusely branched and pubescent. Leaves are opposite, 3 to 5 cm long and blackish green in colour. The inflorescence is a head with 6 to 8 mm diameter. The flower is solitary, white, achene, compressed, and narrowly winged. Many blackish seeds are present in fruit. The appearance of the Flower starts during August- September months and fruiting occur up to November.

The plant has been reported to contain phytosterol, β-amyrin, triterpenes such as ecalbatin, echinocystic acid and flavones such as luteolin and coumarin such as wedelolactone [7]. The whole plant is used as a stimulant. The flowers are used for their analgesic, antispasmodic, fungicidal, digestive, bactericidal and vulnerary properties. The plant is known to have some important pharmacological activities such as hepatoprotective, antimicrobial, antioxidant, anti-inflammatory, antiviral, immunomodulatory and analgesic activity [8-25].

* Corresponding author
E-mail address: shaziz2408@yahoo.com

The aim of current research of *E. prostrata* leaves by UV and FT-IR was to analysis the ethanolic extract to advance information about the functional groups available in different secondary metabolites in this potential plant. This analysis will give out the understanding about the justification of medicinal uses of this plant.

Figure 1 *E. prostrata* leaf

2. Material and methods

2.1. Collection and identification of the plant sample

Fully matured fresh leaves of *E. prostrata* were collected from the area of Baribandh, Mirpur, Dhaka, Bangladesh in the month of April 2018 and identified by the taxonomist of Bangladesh National Herbarium, Dhaka, where a voucher specimen (No.=45933) has been deposited**.**

2.2. Plant materials preparation

The matured leaves of plant were washed to remove dirt and it was air-dried. Then it was oven-dried at reduced temperature less than 45 °C to make it suitable for grinding purpose. The screened (20 mesh) powder was then stored in air-tight container with marking for identification and kept in cool, dark, and dry place for future uses**.**

2.3. Solvents and chemicals

Analytical or laboratory grade solvents and chemicals were used in these experiments. All solvents and regents used in the experiments were procured from E. Merck (Germany), BDH (England).

2.4. Preparation of ethanolic leaf extract

For the process of extraction, powered leaf material (120 g) is submerged in ethanol in an air-tight separating funnel for 5 days at room temperature with occasionally shaking and stirring. The major portion of the extractable compounds of the plant material will be dissolved in the solvent during this and hence extracted as solution. Then the extract was dried by using a rotary evaporator to get ethanol extract (2.0 g).

3. Results and discussion

3.1. UV spectroscopy

The UV absorbance spectra of ethanolic leaves extract of *E. prostrata* were recordedin the range of 250-320 nm. The spectrum and the absorption bands are presented in Fig: 2 and Table: 1 respectively. The spectrum shows weak abosorption bands at 286-294 nm due to the nature of thiophene, acetaldehde, polyene (β-Carotain), quinoline, 3° amine, pyrrole and napthalene. The broad band spectrum at 284nm indicates the presence of ketone& aldehyde groups these groups confirm the presence of flavone& fisteintypes of flavonoids. The characterestics bands at 282 nm, 280 nm, 278 nm & 256 nm show the apperence of flavone & fistein inrespect of aldehyde, ketone, styrene, benzaldehyde, nitro benzene, benzene, 2 methyl-2-nitro propane groupsthese groups confirm the presence of flavone and fisteintypes of flavonoids.. The spectrum bands at 320 nm, 319 nm, 315 nm, 274 nm, 265 nm, 262 nm, 255 nm & 252 nm expressketone, acetophenone, acrolein, quinoline, 2 nitro furan, aniline, -R-NO2,carbon tetrachloride, benzene, furan and pyrrole 2- aldehyde. The sharp bands at 312 nm, 270 nm & 254 nm are allowed for naphthalene,

acetone, phenol, benzoic acid, quinoline, thiophene, octyl nitrate, 1, 3, 5, hexatriene groups. Qucercetin and Anthocyanintypes of flavonoids are also indicated by the spectrum band at 270 nm.

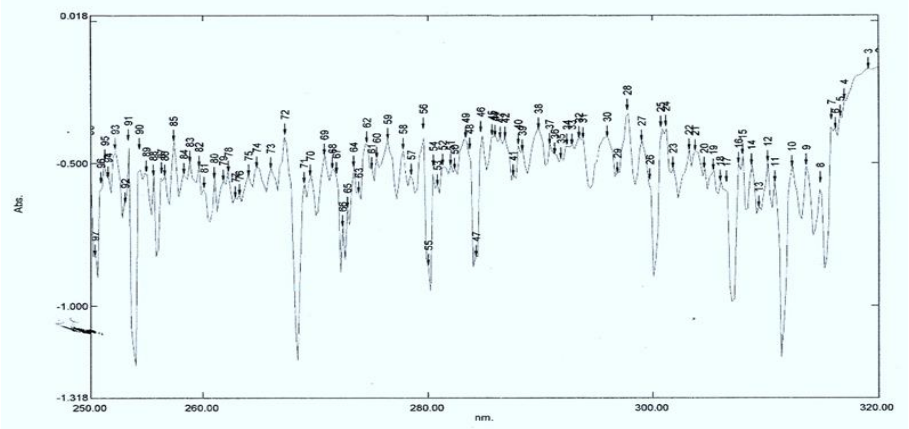

Figure 2 UV Spectrum of ethanolic leaf extract of *E. prostrate*

Table 1 UV spectroscopy of ethanolic leaf extract of *E. prostrate*

Wavelength (nm)	Abs.	Compound	Types of Flavonoids
320.00	-0.165	Ketone	
319.00	0.171	Acetophenone	
315.00	-0.611	Acrolein, Quinoline, 2 nitro furan	
312.00	-0.614	Naphthalene	
294.00	-0.505	Thiophene	
293.00	-0.450	Acetaldehyde	
288.00	-0.438	Quinoline, Pyrrole, 3°amine,Polyene(β-Carotain)	Qucercetin
286.00	-1.032	Naphthalene	
285.00	-2.884	C=O, Amino group(Aniline)	
284.00	0.861	Ketone(C=O) &Aldehyde(CHO)	Flavone &Fistein
282.00	-0.506	Styrene, Ketone(C=O), Aldehyde (-CHO) group	Flavone &Fistein
280.00	-0.860	Benzaldehyde, Nitro Benzene, Benzene,2 Methyl-2-nitropropane, Ketones(C=O) group	Flavone &Fistein
278.00	-0.538	Acetophenone, Ketones(C=O) group	Flavone &Fistein
274.00	-623	-R-NO2	
270.00	-0.681	Acetone, Phenol, Benzoic acid, Quinoline, Thiophene, Octyl nitrate	Qucercetin& Anthocyanin
265.00	-0.518	Carbon tetrachloride	
262.00	-0.573	Toluene	
256.00	-8.000	Anthracene	Flavone
255.00	-0.537	Benzene	
254.00	-1.207	1,3,5 Hexatriene	
252.00	-0.479	Furan,Pyrrole 2-aldehyde	

3.2. FT-IR spectroscopy

The FT-IR spectrum of ethanolic extract of *E. prostrata* leaf shows the peak at 614.01 cm^{-1} indicates the presence of alkyne, C-H bending vibrations and quercetin. The sharp peak at 880.02 cm^{-1} is due to aromatic substitution, gem distributed, olefinic groups. This peak again confirms the presence of quercetin. The very sharp peak at 1047.32 cm^{-1} allows the appearance of sulfur compound, S=O stretching vibrations, thiocarbonyl group sulfoxides and NaQSA [Sodium salts of Quercetin 5' Sulfonic Acid]. The presence of sulfur compound, thiocarbonyl and NaQSA [Sodium salts of Quercetin 5' Sulfonic Acid] further supported by the strong peak at 1087.26 cm^{-1}. Sulfur compound prominently active against microbes. The FT-IR spectrum shows the peak at 1273.07 cm^{-1} specifies the existence of C-N stretching, C-O stretching vibration and aliphatic amine, secondary alcohol functional group. The peak 1329.69 cm^{-1} represents the C-O stretching and C-N stretching bonding and aromatic sulphonamide, gem-dimethyl group &nitro compounds, secondary alcohols. Myricetin (flavonoids) with the functional group of nitro or sulfur compounds, gem- dimethyl group, tertiary alcohol, phenol is indicated by the C-CH_3 bending, C-O stretching vibration peak at 1380.66 cm^{-1}. The characteristic peaks at 1453.52 cm^{-1}, 2926.66 cm^{-1} and 2973.88 cm^{-1} point out the presence of C-H bending, & C-H stretching respectively and indicates the alkanes, cycloalkanes functional group. There is a clear hump at 3349.62 cm^{-1} is corresponding to primary amides functional group and N-H stretching vibrations. FT-IR spectrum of *E. prostrata* leaf reveals the presence of three types of flavonoids viz. quercetin, NaQSA [Sodium salts of Quercetin 5' Sulfonic Acid], myricetin (Fig: 3, Table: 2).

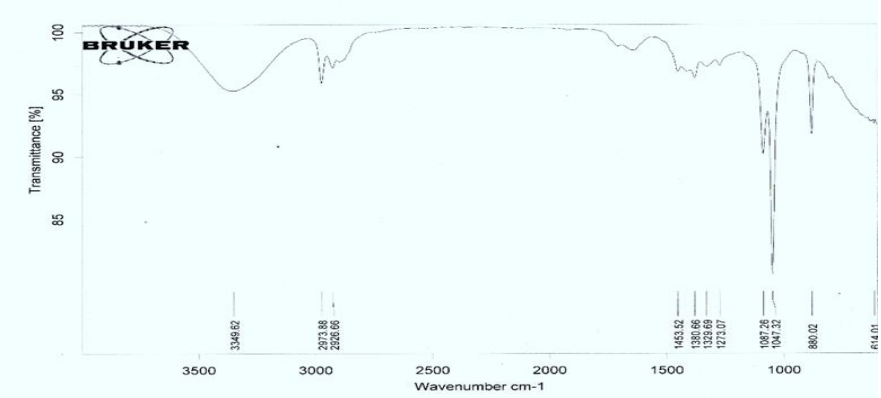

Figure 3 FT-IR Spectrum of ethanolic leaf extract of *E. prostrate*

Table 2 FT-IR spectroscopy of ethanolic leaf extract of *E. prostrate*

SL	Peak Value (cm^{-1})	Bonding Type	Functional Group	Types of Flavonoids
1	614.01	C-H Bending	Alkyne	Quercetin
2	880.02	C-H Bending Vibration	Aromatics substitution, gem-distributed	Quercetin
3	1047.32	S=O stretching Vibration	Sulfur compounds, sulfoxides, Thiocorbonyal group	NaQSA
4	1087.26	S=O stretching Vibration	Sulfur compounds, Thiocorbonyal group	NaQSA
5	1273.07	C-N stretch	Aliphatic amine	
6	1329.69	C-N stretch C-O str	Aromatic Sulphonamide, gem-dimethyl group & Nitro compounds, Secondary Alcohols	Myricetin
7	1380.66	C-CH3 bending C-O str	Nitro/Sulfurcompounds, gem-dimethyl group, Tertiary alcohols	Myricetin
8	1453.52	C-H bend	Alkanes	
9	2926.66	C-H stretching	Cycloalkanes, Alkanes	
10	2973.88	C-H stretching	Cycloalkanes	
11	3349.62	N-H stretch	1°, 2° amines, Amides	

4. Conclusion

The results of the investigation give the primary knowledge as a possible source of drugs to determine the chemicals composition of *E. prostrata* leaf. The presence of chromophoric groups, functional groups and flavonoids are mainly donated in the medicinal utilities of the plant. The contemporary study increases the traditional usage of *E. prostrata* which have several known and unknown bioactive compounds. By isolating and identifying these bioactive compounds new noble drugs can be expressed to treat various diseases.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest.

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