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Chemistry

Spectroscopic Analysis of *Terminalia Chebula* Ethanolic Seed Extract By UV & FT-IR and Phytochemical Screening

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Abstract: *Terminalia chebula* is widely grown an important medicinal plant. The present work deals with phytochemical screening, UV and IR spectroscopy of ethanolic seeds extract of *Terminalia chebula*. In phytochemical screening the extract shows the presence of flavonoids, glycosides, phytosterols, terpenoids, phenolic compound, carbohydrates, proteins, tannins, gum and mucilage. The UV and IR spectroscopy of ethanolic seeds extract of *Terminalia chebula* shows the presence of Carbonyl group (ketone), α-β unsaturated amide and lactam, aromatic nature of compound, sulfur compound, nitro compound, flavones, fistin, quercetin, NaQSA (Sodium Salts of Quercetin 5' Sulfonic Acid),, myricetin, chalcones and anthocyanin types of flavonoids. The above mention bioactive compound are mainly contributed in medicinal utility of the plant.
Keywords: *Terminalia chebula*, phytochemical, ultra violet spectroscopy, Flavonoids, chromophoric groups.

INTRODUCTION

Terminalia chebula locally known as haritaki in Bangladesh with family; Combretaceaeis a tree tall about 50-80 ft in height. It has rounded crown and spreading branches. The bark is dark grown with some longitudinal cracks. The flowers are dull white with spikes and can be found at the end of the branches [1]. *Terminalia chebula* is called the "king of medicines" in Tibet and is always listed first in the Ayurvedic material medica because of its extraordinary powers of healing. Many medicinal compound have been isolated from *Terminalia chebula* like Tanins[2], chebulagic acid[3] and tannase production [4].

Terminalia chebula has been used as potential medicinal agent in HIV-1 integrase inhibition[5], radiation protection[6], growth inhibition[7], antioxidant effects[8,9], cytoprotective effect [10], renoprotective [9], cancer growth inhibitor[11], liver toxic agent[12], and myocardial infection[13] and in elucidation of antimicrobial[14] and metabolic constituents[15]. *T. chebula* fruit and seeds exhibited dose dependent reduction in blood glucose of streptozotocin induced diabetic rats both in short term and long term study and also had renoprotective activity[16,17].

Fig-1: Seeds of *Terminalia chebula* Retz

The aim of current study was to analysis the ethanolic extract of *Terminalia chebula* seed by UV & FT-IR along with phytochemical screening to get knowledge about the functional groups present in various secondary metabolities in this important medicinal plant. This will serve the knowledge about the justification of medicinal uses of seeds of this plant.

MATERIALS AND METHODS

Collection and identification of the plant sample

Fully matured fresh seeds of *Terminalia chebula* were Collected from local area of Rajshahi district in Bangladesh and identified by the taxonomist of Bangladesh National Herbarium, Dhaka, where a voucher specimen (No=4390) has been deposited.

Plant materials preparation

The matured seeds (Figure1) of *Terminalia chebula* were washed to remove dirt and it was air-dried. Then it was oven-dried at reduced temperature less than 45^0C 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 use.

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).

Preparation of ethanolic seed Extract

In extraction the powered seed materials (120 g) is submerged in suitable solvents of increasing polarity as ethanol subsequently 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 same time and hence extracted as solution. Then these extracts were dried by using a rotary evaporator to get ethanol extract (2.0 g). The extract thus obtained was than subjected to preliminary phytochemical screening for identification of various plant constituents by methods suggested by standard methods [18-20].

To find out the flavonoids, chemical and functional groups of phytochemicals present in the extract, spectral studies were carried out by Ultra-Violet and Infra-Red Spectroscopy [21-25].

RESULTS AND DISCUSSIONS

Phytochemical screening

The ethanolic seed extract of *Terminalia chebula* shows the shows the presence of flavonoids, glycosides, phytosterols, terpenoids, phenolic compound, carbohydrates, proteins, tannins, gum and mucilage. The results are presented in Table-1.

Table-1: Phytochemical Screening of ethanolic seed extract of *Terminalia Chebula*

Sl No.	Plant constituents Test/Reagents	Result	Sl No.	Plant constituents Test/Reagents	Result
1.	Alkaloid		6.	Saponins	
	(i) Mayer's reagent	-		(i) Foam test	+
	(ii)Wager's reagent	-	7.	Phenolic Compounds	
	(iii) Hager's reagent	-		(i) Ferric chloride solution	+
2.	Carbohydrates		8.	Tannins	
	(i) Molisch's test	+		(i) Lead acetate solution	+
	(ii) Benedict's reagent	+	9.	Protein	
	(iii) Fehling solution	+		(i) Xanthoproteic test	+
3.	Types of Carbohydrates			(ii) Biuret test	+
	(i) Glucose	-	10.	Amino acids	
	(ii) Fructose	-		(i) Ninhydrin reagent	+
	(iii) Galactose	-	11.	Gums and Mucilages	
	(iv) Lactose	+		(i) Alcoholic precipitation	+
	(v) starch	+		(ii) Molisch's test	+
4.	Glycosides		12.	Anthraquinones	-
	(i) Keller kiliani test	+		Borntrager's test	
5.	Phytosterols		13.	Terpenoids	
	(i) Liebermann's test	+		(i) Salkowski test	+
			14.	Flavonoids	
				Conc H_2SO_4+ Magnesium ribbon	+

UV Spectroscopy

The UV-Vis absorbance spectra of ethanolic seeds extract of *Terminalia chebula* were recorded in the range of 274-288 nm. The spectrum & absorbance are presented in Figure-2 & Table-2 respectively.

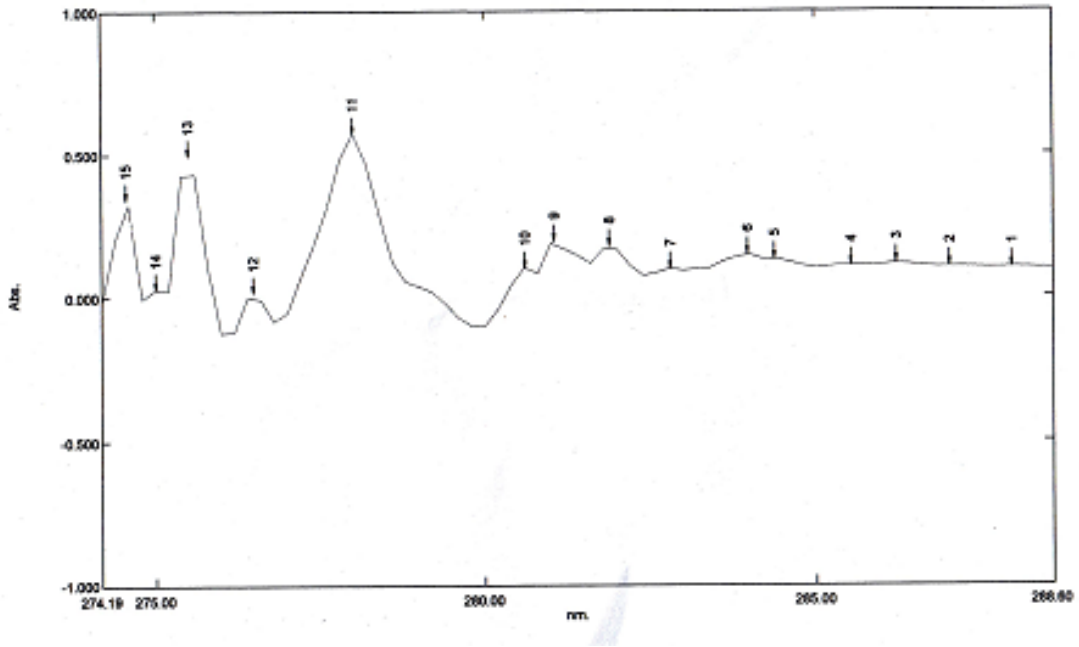

Fig-2: UV spectrum of ethanolic seed extract of *Terminalia chebula*

The absorption band at 287.98 nm is due to polyene (β-carotene). A broad band at 287.04 nm indicates the presence of Amide group (protein). There is a band at 286.22 nm reveals the presence of Alkene group (Naphthalene). The band at 285.54 nm shows the presence of Amino group (Aniline). The characteristic band at 284.38 nm, 283.98 nm and 282.80 nm is due to Ketones, aldehydes group. The band at 281.88 nm and 281.06 nm shows the presence of Aldehydes group. The sharp band at 280.60 nm, 278.00 nm and 276.48 nm is due to Ketones group. The band at 275.50 nm, 275.00 nm and 274.56 nm shows the presence of Alkene group.

Table-2: Absorbance in UV spectrum of ethanolic seed extract of *Terminalia chebula*

Sl. No.	Wavelength (nm)	Abs.	Chromophoric group
1	287.98	0.105	Polyene (β-carotene)
2	287.04	0.108	Amide group(protein)
3	286.22	0.119	Alkene group (Naphthalene)
4	285.54	0.113	Amino group (Aniline)
5	284.38	0.134	Ketones, aldehydes
6	283.98	0.150	Ketones, aldehydes
7	282.80	0.101	Ketones, aldehydes
8	281.88	0.181	Aldehydes
9	281.06	0.197	Aldehyde
10	280.60	0.104	Ketones group
11	278.00	0.575	Ketones group
12	276.48	0.019	Ketones group
13	275.50	0.499	Alkene group
14	275.00	0.031	Alkene group
15	274.56	0.344	Alkene group

FT-IR Spectroscopy

The FT–IR spectra of *Terminalia chebula* showed the presence of various characteristic functional groups of different phyto constituents present in *Terminalia chebula*. FT-IR active absorption bands of *Terminalia chebula*. Are enlisted along with their assignments in Figuer-3 and Table-3 respectively. Absorption bands at 3359.95 cm^{-1} may be present due to stretching vibration of O-H of polyphenol. However, absorption at 2977.12 cm^{-1} is due to C-H (alkanes) stretching vibration. The Strongest band at 1703.42 cm^{-1} may be due to C=O stretching vibration indicates tannin. The absorption bands at 1613.85 cm^{-1} is due to N-H (amide) bending. A medium strong absorption peak appearing at 1448.60 cm^{-1} is due to C=C (aromatic) stretching vibration. The characteristic peak at 1333.336 cm^{-1}, 1210.40 cm^{-1} and 1042.39 cm^{-1} are recorded due to stretching mode of C-F (alkyl halide).

The sharp peak at 877.36 cm^{-1} is due to =C-H (alkene) indicates quercetin. The absorption peak at 642.70 cm^{-1} is noticed due to C-Br (alkyl halide) stretching vibration.

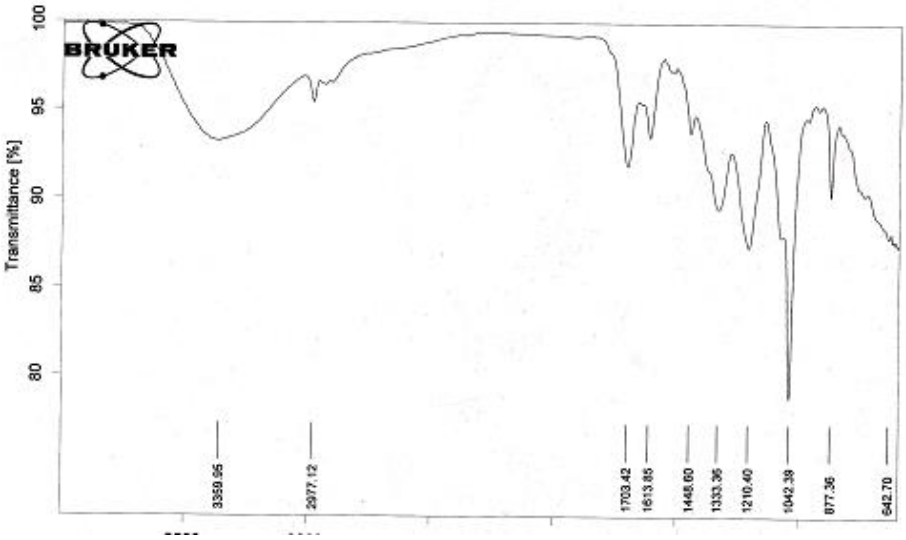

Fig-3: FT-IR spectrum of *Terminalia chebula*

Table-3: FT-IR spectroscopy of ethanolic seed extract of *Terminalia chebula*

S. No.	Peak value (cm^{-1})	Functional group	Types of Flavonoids
1	642.70	Alkyl Halide, C-Br stretching vibration.	-
2	877.36	Alkene, =C-H bending vibration	Quercetin
3	1042.39 1210.40 1333.36	Alkyl Halide, C-F stretching vibration	-
4	1448.60	Aromatic, C=C stretching vibration.	-
5	1613.85	Amide , N–H bending vibration	-
6	1703.42	Carbonyl Group, C=O stretching vibration.	Tannin
7	2977.12	Alkanes, C–H stretching vibration.	-
8	3359.95	Alcohols, O–H stretching vibration.	Polyphenol

CONCLUSION

This investigation has given preliminary information to determine the chemical composition of *Terminalia chebula* seed. The presence of chromophoric group, functional group, flavonoids, glycosides, phytosterols, terpenoids, phenolic compound, tannins is mainly contributed in medicinal utility of plant. The presence of these bioactive compounds in plant extract confirms the correct use of seed of this plant in traditional medicinal system. It also holds for the production of novel drugs with isolation of specific compound.

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