Original Article

EXTRACTION, IDENTIFICATION AND FTIR-ANALYSIS OF TERMINALIA CHEBULA SEED

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Abstract

Herbal drug of Terminalia chebula the seed part have various therapeutic activity, hence the present study was undertaken to analysis of Terminalia chebula both in phytochemical and FTIR analysis belongs to functional group confirmation. The phytochemical analysis showed positive result for most of the tests assessed and FTIR showed positive result for alcohol, alkenes, aldehydes, aromatic compounds, nitro compound, ether, aliphatic compound, alkyl halides and isothiocyanate.

KEY WORDS: Extraction, Anti-inflammation, Wound healing, Seed, FTIR analysis.

INTRODUCTION

In local communities all over the world, medicinal plants have long been used as a source of healing. For almost 85% of the world's population, it still serves as their primary health care professional, and 80% of all synthetic pharmaceuticals are derived from it, making it an important resource for drug development [1].

Terminalia chebula, (Combretaceae) is known as the **"King of Medicines"** and is consistently listed first in the Ayurvedic material medica due to its exceptional restorative properties and broad range of biological activity. Since ancient times, the seed of Terminalia chebula Retz has been used to treat a variety of illnesses and disorders.

Apart from the chemistry of Terminalia chebula chemicals, significant progress has been made in the last 50 years on the biological activity and therapeutic uses of this plant.[2]

It is currently regarded as an important source of distinct natural products for the formulation of both industrial products and medicine to treat a variety of diseases. The biological and pharmacological properties of Terminalia chebula extracts and some of its isolated components, clinical investigations, and potential medical uses are principally covered in this review, along with an assessment of their safety.[3]

A vital ingredient of the Ayurvedic formulation used for anti-inflammatory and anti-diabetic objectives is Terminalia chebula. The dried seed is also widely utilized in Ayurveda as laxative, diuretic, cardio tonic, and homeostatic drug. Furthermore, it is exploited as a pain reliever for dry coughs.[4]

MATERIALS AND METHODS:

Collection of Seeds

The seed of Terminalia chebula were collected from tree growing in the Komarapalayam village, Namakkal district, and Salem hills area. Tamilnadu during the month of august to September. The seed was dried at 20 days, and then it was blended into coarse powder by mortar and pestle. The powdered drug was passed through to sieve No.20 to get uniform particle size.

Extraction

Dry the crude drug sample at 85^0C for 3 hours; Take 30gm of sample with 750ml of 99.9% ethanol (solvent), Assemble the extraction in Soxhlet apparatus and extract the crude drug with the solvent at 40-50^0C **Continue the process for 14 hours.** Remove the heat source and drain the solvent from the extract. Repeat the procedure with same sample. Replace the flask on heat source and evaporate off solvent. Cool the flask and weigh the contents.

PRELIMINARY PHYTOCHEMICAL ANALYSIS

Test for Alkaloids

Preparation of test solution: The test solution was prepared by dissolving the extract in dilute HCL and filters the extract.

Dragendorff"s test

By adding 1ml of Dragendorff"s reagent to 2 ml of extract, an **orange red precipitate** was formed, indicating the presence of alkaloids.

Mayer's test

Few drops of Mayer's reagent were added to 1 ml of extract. A **yellowish or white precipitate** was formed, indicating the presence of alkaloids.

Hager's test

Two milliliters of extract were treated with few drops of Hager's reagent. A **yellow**

Precipitate was formed, indicating the presence of alkaloids.

Test for Carbohydrates

Molish test

Few drops of alcoholic a-naphthol solution were added to 2 mL of extract. Later, few drops of concentrated H2SO4 were added along the walls of test tube. At the junction of two liquids, a **violet colour ring** appeared, indicating that carbohydrates were present.

Benedict's test.

To 5 mL of Benedict's reagent, 8-10 drops extract were added, then heated for five minutes; the resulting dark red precipitate indicated the presence of carbohydrates.

Fehling's test

To 2 mL of extract, an equal volume of Fehling's (A & B) solution was added and heated for five minutes, the resulting red/dark red precipitate indicating the presence of carbohydrates.

Tests for Glycosides

Keller Killiani test.

A solution of 0.5 mL, containing glacial acetic acid and 2-3 drops of ferric chloride, was mixed with 2 mL of extract. Later, 1 mL of concentrated H2SO4 was added along the walls of the test tube. The appearance of deep blue colour

Test for Flavonoids

Shinoda test

To dry powders add 5 ml of 95% ethanol, few drops of conc. HCl and 0.5 g magnesium turnings. Pink colour observed.

Test for Phenolic Compounds

Ferric Chloride test

1ml of extract and 4ml of alcoholic and few drop of neutral fecl3

Test for Starch

Iodine test.

Two milliliters of iodine solution with potassium iodine were added to 2 mL of test extract, and the appearance of a blue colour indicated that presence of starch.

FOURIER TRANSFORM INFRARED ANALYSIS

Weigh about 300 mg of previously dried KBr and transfer it to a clean mortar. Weigh about 2 to 4 mg of previously dried sample or as per the specified specification (to make sample concentration about 1.0% w/w) and transfer to the mortar, which contained the KBr. Mix the sample with KBr for homogeneous. Use this sample for the sample spectrum

A strong and broad peak at 3402.75 cm^{-1} can be attributed due to O-H group of alcohol. The conclusion that seed extract of Terminalia chebula is composed of alcohol, carbohydrates, glycoside, flavonoids, phenolic compounds, starch compound of phytochemical analysis process.[6]

The bands at 2925.31, 2854.82, 1035.08 and 873.20 are assigned to C-H stretching mode in alkenes and the peak 2046.97, corresponding to isothiocyanate. The band at 762.3 and 641.41 can be attributed to C-Cl and C-Br of alkyl halides. The absorption band of 1529.37 cm^{-1} indicated the presence of nitro compounds in N-O Stretching mode [7].The alcohol present in the Terminalia chebula seed extract indicates that the presence of anti-inflammatory wound healing property.[8]

RESULTS

Phytochemical analysis

The results obtained from phytochemical analysis and FTIR was showed below.

The table 1 shows the presence of phytochemical compounds like alkaloids carbohydrates, glycoside, flavonoids, phenolic compounds, starch.

PHYTOCHEMICAL ANALYSIS

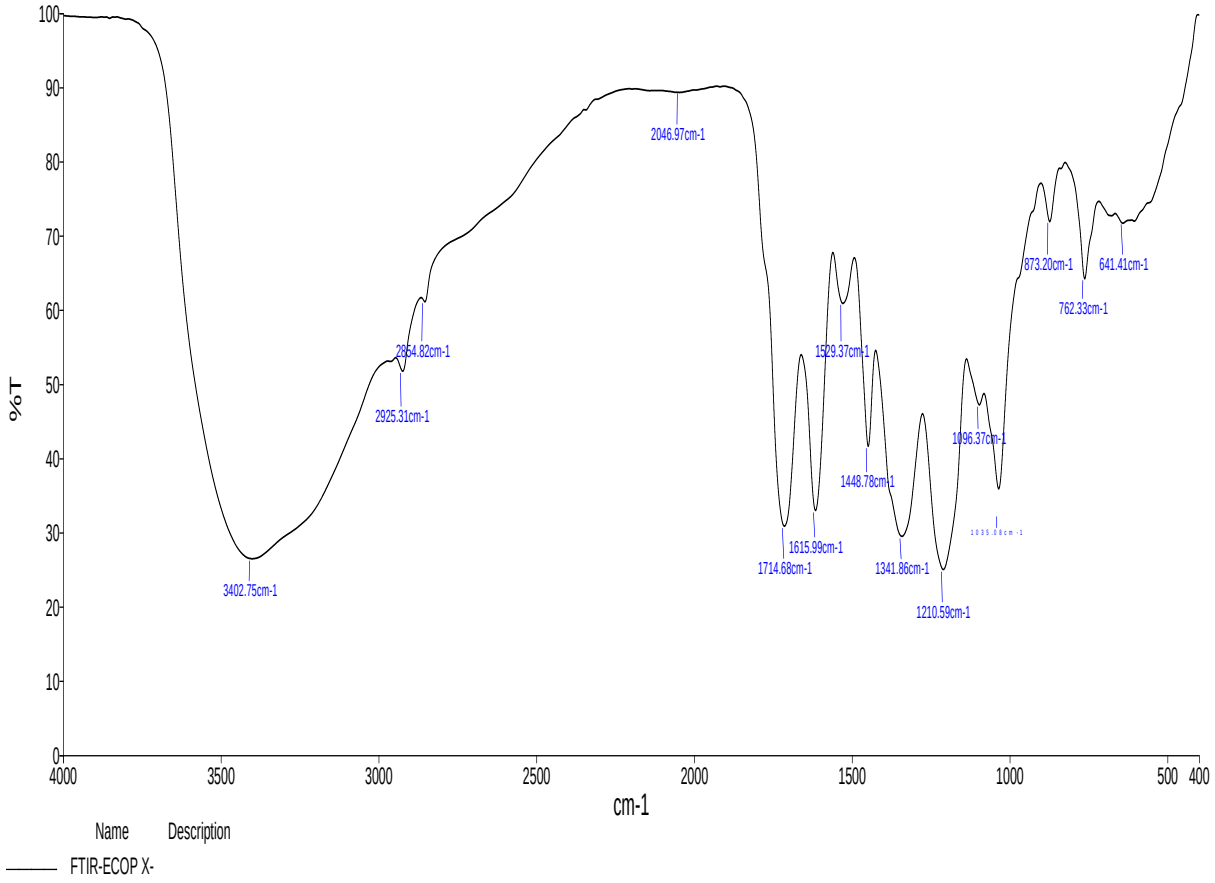
Table 1: Phytochemical analysis of *Terminalia chebula*

S.NO	METABOLITES	TESTS	SOLVENT	RESULTS
1	**ALKALOIDS**	DRAGENDORFF'S TEST	ETHANOL 99.9%	+
2		MAYER'S TEST	ETHANOL 99.9%	+
3		HAGER'S TEST	ETHANOL 99.9%	+
4	**CARBOHYDRATES**	MOLISH TEST	ETHANOL 99.9%	+
5		BENNEDICT'S TEST	ETHANOL 99.9%	+
6		FEHLING'S TEST	ETHANOL 99.9%	+
7	**GLYCOSIDES**	KILLER KILLANI TEST	ETHANOL 99.9%	+
8	**FLAVONOIDS**	SHINODA TEST	ETHANOL 99.9%	+
9	**PHENOLIC COMPOUNDS**	FERRIC CHLOROID TEST	ETHANOL 99.9%	+
10	**STARCH**	IODINE TEST	ETHANOL 99.9%	+

FUNCTIONAL GROUP CONFIRMATION OF FTIR – BAND SPECTRUM

The functional group confirmation of FTIR analysis shows the different types of stretching indicates presence of specified functional groups. FTIR is shown in the table.

Figure: 1. FTIR spectrum



FTIR - SPECTRUM CONFIRMATION FOR FUNCTIONAL GROUPS

Table 2: Functional group confirmation of Terminalia chebula

S.NO	ABSORPTION BAND ($cm^{-1)}$	FUNCTIONAL GROUP	STRETCHING
1	**3402.75**	Alcohol	O-H
2	**2925.31**	Alkenes	C-H
3	**2854.82**	Alkenes	C-H
4	**2046.97**	Isothiocyanate	N=C=S
5	**1714.68**	Aldehydes	C=O
6	**1615.99**	Aromatic compounds	C=C
7	**1529.37**	Nitro compounds	N-O
8	**1448.78**	Aromatic compounds	C=C

9	**1341.86**	Alcohol	O-H
10	**1210.59**	Ether	C-O-C
11	**1096.37**	Aliphatic	C-O
12	**1035.08**	Alkenes	C-H
13	**873.20**	Alkenes	C-H
14	**762.33**	Alkyl halides	C-Cl
15	**641.41**	Alkyl halides	C-Br

CONCLUSION

FTIR method is used to identify the functional group and stretching present in the extract and describe any potential interactions associated with inflammation in deep wounds. Ethanolic extracts of FTIR spectra were examined and displayed in figure.1. The broad band at 3402.75 and 1341.86 cm^{-1} in the spectrum of the herbal ethanolic extract corresponded to the alcohol functional group. The C-H stretch that produced the peak at 2925.31, 2854.82, 1035.08, 873.20 cm^{-1} indicates the existence of alkenes. The peak at 762.33 and 641.41 cm^{-1} correspond to the alkyl halides in the C-Cl and C-Br stretching. The C=C stretch that produce the peak at 1615.99 and 1448.78 cm^{-1} indicate the aromatic compound. The peak at 2046.97 cm^{-1} in isothiocyanate in N=C=S stretch. The C=O that produce peak at 1714.68 corresponding to aldehydes. The broad band at 1529.37 indicate the presence of nitro compound and 1448.78 indicate the presence of C-H stretch..The peak at 1210.59 indicates the existence of ether and 1098.37 indicates the aliphatic group.

DISCUSSION

The role of the plant seed extract presence of some functional group in the *Terminalia chebula* seed extract and the synthesized were investigated by FTIR analysis.FTIR analysis was used to identify and get an approximate idea of the possible bio-molecules that are responsible for stabilization of seed extract of *Terminalia chebula*

The major and strongest vibration mode in the Terminalia chebula seed extract spectrum are those located at 3402.75,2925.31,2854.82,2046.97,1714.68,1615.99,1529.37,1448.78,1341.86,

1210.59, 1096.37, 1035.08, 873.20, 762.33, 641.41cm^{-1}

A strong and broad peak at 3402.75 cm^{-1} can be attributed due to O-H group of alcohol. The conclusion that seed extract of *Terminalia chebula* is composed of alcohol, carbohydrates, glycoside, flavonoids, phenolic compounds, starch compound of phytochemical analysis process

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The absorption band of 1529.37 cm^{-1}indicated the presence of nitro compounds in N-O Stretching mode .The alcohol present in the *Terminalia chebula* seed extract indicates that the presence of anti-inflammatory wound healing property.

REFERENCE

1. Martin Fitzgerald et.al, Michael Heinrich, Anthony Booker Medicinal Plant Analysis: A Historical and Regional Discussion of Emergent Complex Techniques 2020 Jan 9; 10(3):1480

2. Sunbal Khalil et.al, Saboon Sohaib Arshad, Muhammad Shoaib Amjad , Mohd Sayeed Akhtar Natural Compounds Extracted from Medicinal Plants and Their Applications Natural Bio-active Compounds, 2019 ISBN: 978-981-13-7153-0

3. Chattopadhyay et.al, Bhattacharyya Study of Plant Review of Terminalia chebula: An update Pharmacognosy Reviews, 2007 may; vol 1:151-153

4. Hae lim kim, bong keun choi,seung hwan yang Terminalia chebula medicinal uses:a review of in vitro in vivo studies biotechnology and bioprocess engineering oct 2022 27,703-713

5.Karpagam et.al, Monomania FT-IR Analysis of Terminalia Billerica and Their Antimicrobial Activity on Nonwoven Fabrics, International Journal for Research in Engineering Application & Management: 10.18231/2454-9150.2019.0412

6.Yatish,et.al,MithunPrakas,Ningaraju.Saka,GeethaBalakrishna,.Lalithamba Terminalia chebula as a novel green source for the synthesis of copper oxide nanoparticles and as feedstock for biodiesel production and its application on diesel engine, Volume 215, Part B, 15 January 2021, 119165

7. Berthomieu et.al, Hienerwadel R. Fourier transforms infrared (FTIR) spectroscopy. Photosynthesis Res. 2009 Aug-Sep; 101(2-3):157-70. Doi: 10.1007/s11120-009-9439-x. Epub 2009 Jun 10. PMID: 19513810.

8. Tulay Baykal et.al, Kazım Yildiz Fourier Transform Infrared (FT-IR) Spectroscopy for Biological Studies, G.U. Journal of Science 22(3): 117-121 (2010)