PHYTOCHEMICAL AND FTIR ANALYSIS OF *AILANTHUS TRIPHYSA* LEAVES

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ABSTRACT: *The Present study was carried out in Ailanthus triphysa leaves to analyze the phytoconstituent and to characterize the bioactive compounds using FTIR. Extraction was carried out by maceration method with various solvents such as ethanol, ethyl acetate, chloroform, hexane and aqueous. The phytochemical analysis revealed the presence of alkaloids, flavonoids, steroids, terpenoids, phenol, and saponin. The FTIR analysis confirms the presence of amine (c-n), methylene (-CH2-), carboxylic acid (C=O), alkenes (C=C), alcohols (-OH) & ether (C-O-C), ester (C=O) and vinylidene (C=C). From the results obtained it has been proved that the Ailanthus triphysa leaves have many active compounds which could be separated and used for further studies like antimicrobial, antifungal, antioxidant, anticancer and Insilco studies to determine its therapeutic values for the development of new drugs.*

Key Words: *Ailanthus triphysa, Phytochemical, FT-IR.*

1. INTRODUCTION:

Plants are used in treatment of various diseases since in ancient time. Medicinal plant is used for traditional medicine contains variety of substance used to treat chronic, infectious disease. Many biological activities are present in medicinal plant such as antibacterial, antimicrobial, antifungal, anticancer, antifungal, antidiabetic and wound healing activity [1]. According to WHO, nearly 20,000 of medicinal plant is available in 91 countries. Ayurveda, Hoemoeo and unani use different types of medicinal plant for drug discovery. *Ailanthus triphysa* has an antipyretic property and they are useful in dyspeptic complaints. *Ailanthus triphysa* (also *Ailanthus malabarica*) belonging to the family of Simaroubaceae and it is commonly known as halmaddi in India, originated from Asia and Australia. Different parts of this plant are used as medicine for variety of diseases. The woods contain various alkaloids and quassinoids and beta-carboline and it has been used for treatment of various diseases like dyspepsia, bronchitis, dysentery; bark decoction used in typhoid and constipation; root bark is used for cobra poisoning and it is also used in asthma. The plant roots, leaves, bark and gum are used as medicine in India [2]. When the bark is cut, a sticky resin is excreted, and it became brittle and drying and the resins is used in medicinal purpose [2]. The timber is used in manufacturing of matchbox. This plant is aromatic in nature, so it is widely used in manufacturing of incense and this plant is the highest priority for safety matches industry and major wood used for manufacturing of splints [3]. Thus, the objective of our study is chemical composition of *Ailanthus triphysa* by FT-IR, and phytochemical.

1.1 Screening of phytochemical:

The medicinal plant produce chemical substance is useful for physiological action on the human body. Those chemicals substance is termed as phytochemical. Phytochemical also called phytonutrient. Phytochemical is the bioactive non-nutrient compound which is found in plants and it is having protective and disease preventive property. Phytochemical is a qualitative and quantitative analysis of compound. The plants with odour (terpenoids), Pigmentation (tanins and quinine), flavour (capsacin) [4].

1.2 FT-IR:

FTIR is most helpful for recognizing synthetic compounds that are either natural or inorganic. It very well may be used to quantitate a few segments of an obscure blend and for the examination of solids, fluids, and gases. The term Fourier Transform Infrared Spectroscopy (FTIR) suggest to an advancement in the way in which the information is gathered and changed over from an obstruction example to a range. It is an intense device for distinguishing sorts of synthetic bonds in a particle by creating an infrared retention range that resembles a sub-atomic "unique finger impression"[5].

2. MATERIALS AND METHODOLOGY

2.1 Preparation of crude extract of *Ailanthus triphysa*:

The leaves of *Ailanthus triphysa* was collected from Bangalore. They were dried and powdered after which the extraction procedure by maceration method was carried out using various solvent such as ethanol, hexane, chloroform, ethyl acetate and aqueous for 8 hr at 30° C. The extract obtained was filtered through a Whatman no. 1 filter paper to remove the unwanted materials or insoluble substance. The extract is then stored and used for further investigation.

2.2 Phytochemical screening:

Phytochemical analysis was carried out on all the extract using standard procedure to identify the phytoconstituents as described by [6].

2.2.1 Test for flavonoids:

1 ml of the extract, 2 ml of ammonia solution was added. Formation of yellow colour confirms the presence of flavonoids.

2.2.2 Test for steroids:

2 µl of chloroform was added to 1 ml of the extracts and a few drops of acetic acid and concentrated H_2SO_4 was poured in to the mixture. The appearance of blue and green colour showed the presence of steroids,

2.2.3 Test for Saponins:

About 0.2 g of the extract was shaken with 5ml of distilled water and then heated until it boils. Frothing (appearance of creamy miss of small bubbles) showed the presence of saponins.

2.2.4 Test for phenol

1 ml of extract was dissolved in 2ml of distilled water. Few drops of ferric chloride were added. A dark inexperienced color indicates the presence of synthetic resin compound.

2.2.5 Test for tannins

Braymer's test: 2 ml of the extract was treated with 10% ferric chloride and shaken vigorously and then observed for the appearance of blue or greenish colour.

2.2.6 Test for terpenoids

Salkowki's test: 1 ml of chloroform was added to 2 ml of the extract and few drops of concentrated sulphuric acid was added. The appearance of Reddish-Brown precipitate confirms the presence of terpenoids.

2.2.7 Test for carbohydrate:

2 ml of the extract was taken in a test tube with 2 drops of iodine and 1 ml water. The appearance of dark-blue colour indicates the presence of starches.

2.2.8 Detection of alkaloids

a) **Dragondroff's reagent:** A small amount of concentrate was treated with 3-5drops of Dragondroff's reagent and looked for the development of reddish- brown precipitate (or colouration). Or Extracts (2ml) were dissolved individually in 1%dilute hydrochloric acid and filtered. The filtrates were used to test for the presence of alkaloids.

b) **Mayer's Test:** Filtrates were treated with few drops of Mayer's reagent (potassium mercuric iodide). Formation of a yellow cream precipitate indicates the presence of Alkaloids.

c) **Wagner's test**: Filtrates were treated with Wagner's reagent (iodine in potassium iodide). Formation of brown/reddish brown precipitate indicates the presence of alkaloids.

2.3 FTIR procedure:

In FT-IR analysis the powder sample was centrifuged at 3000 rpm for 10 minutes and the filtered through Whatman no.1 filter paper by using vacuum pump. The FT-IR spectroscopic analysis was performed by diffused reflectance technique. The FT-IR spectra of DI-I was recorded in the range of wave number 400 - 4000 $cm^{-1.}$ FT-IR spectra was recorded for the compound, dried by mixing with kbr. A KBr spectrum as a blank was taken. Then, mix the crystalline powder with standard spectroscopic grade KBr powder in 1:100 ratio and take their spectra to detect their characteristic peaks and their functional group, the peak values where recorded. The analysis where performed twice for the spectrum confirmation [7].

3. RESULTS AND DISCUSSION

3.1 Phytochemical analysis:

Phytochemical analysis was done in various solvent extracts (ethanol, chloroform, hexane, ethyl acetate and aqueous) of *Ailanthus triphysa* leaves in which the presence of alkaloids, flavonoids, steroids, terpenoids and saponin were confirmed and listed in table 1. When compared with other ethyl acetate extract showed more positive result.

Table.1 Phytochemical analysis of different extracts of *Ailanthus triphysa* leaves.

S.NO	Test	Ethanol	Ethyl acetate	Chloroform	Hexane	Aqueous
1	**Alkaloids**					
	Dragondroff test	--	++	--	++	++
	Mayer test	--	++	--	++	++
	Wagner test	--	++	--	++	++
2	**Carbohydrate**	-	-	-	-	-
3	**Saponins**	-	++	++	-	++
4	**Phenol**	++	++	-	-	++
5	**Terpenoids**					
	Salkowki's test	++	--	++	--	--
6	**Steroids**	--	++	--	++	--
7	**Flavonoid**	++	++	--	--	--
8	**Tannin**	--	--	--	--	--

3.2 FTIR ANALYSIS:

FT-IR spectroscopy was carried out to ascertain functional groups. FT-IR spectrum was recorded in diffused reflectance mode. The FT-IR spectrum of IR absorption bands in the high wave region at 328.77 cm-1 and 1029.36 cm1; attributed to (C-N), -OH, C=O and -CH2 asymmetric and symmetric stretching vibrations respectively. In finger print region, the FT-IR spectrum presents dominant bands at1610, 1442, 1319, 1029, 819, 759 cm-1 and many other bands of medium to weak intensity. The observed band at 1610 cm-1 can be assigned to C=O stretching of –COOH functional group. Other bands in the spectral range are assigned to bending vibrations of –OH, CH2 and CH3 groups as well as to skeletal bending bonds. The band at 1319 cm-1 is due to C-O stretching among others. The intense band as 1029 cm-1 in IR spectrum is due to vibration of the C=O group. Theoretical wave numbers responsible for functional groups are compared with observed wave numbers. The result is presented in Table 2 and the FTIR graph is shown in Fig.1.

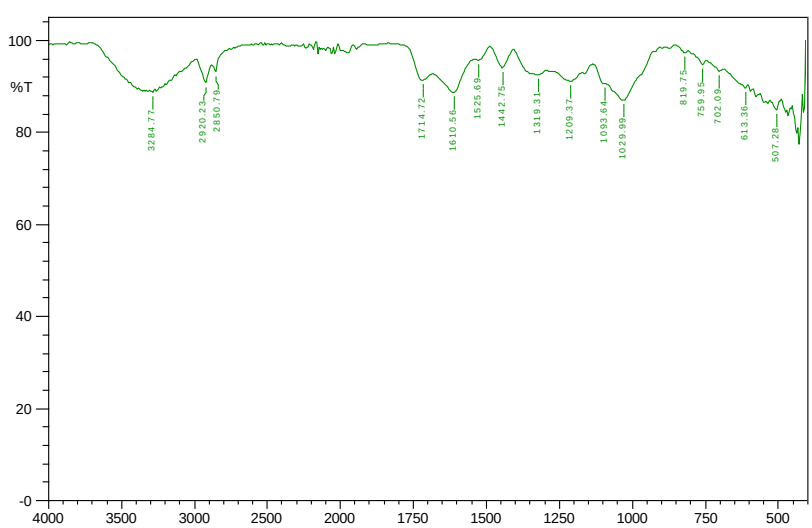

Figure 1: Fourier transform infrared spectrum of *Ailanthus triphysa*

Table 2: FTIR peak value and functional group of crude extract of *Ailanthus triphysa* leaves.

3284.77	Amine (c-n)
2920.23	Methylene (-CH2-)
2850.79	Methylene (-CH2-)
1714.72	Carboxylic acid (C=O)
1610.56	Alkenes (C=C)

1525.69	Alkenes (C=C)
1442.75	Alkenes (C=C)
1319.31	Alkenes (C=C)
1209.37	Ester (C=O)
1093.64	Alcohol (-OH) & Ether (C-O-C)
1029.99	Alcohol (-OH) & Ether (C-O-C)
819.75	Vinylidene (C=C)
759.95	---
702.09	---
613.36	---

CONCLUSION:

The phytochemical analysis and active compound determination of the leaves of *Ailanthus triphysa* deals with phytochemical and active compound investigation of the plant *Ailanthus triphysa*. Since the perusal of the literature revealed that only little information was available on this plant species hence this study was designed for the identification of phytochemicals and active compound for the first time to establish folklore clams. The phytochemical analysis using crude sample revealed the presence of alkaloids, flavonoids, tannin, steroids, phenol and saponin using various solvents such as Ethanol, Ethyl acetate, chloroform, Hexane, Aqueous. The FTIR analysis of the leaves of *Ailanthus triphysa* reviled the presence of amine (c-n), methylene (-CH2-), carboxylic acid (C=O), alkenes (C=C), alcohols (-OH) & ether (C-O-C), ester (C=O) and vinylidene (C=O). From the above studies it has been cleared that the leaves of *Ailanthus triphysa* have many phytochemicals and the active compounds which could be separated and used for further studies like antimicrobial, antifungal, antioxidant, anticancer and for Insilco studies to further determine its therapeutic values or for the development of new drugs.

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REFERENCE:

1. Sasidharan S, Chen Y, Saravanan D, Sundram KM, Latha LY. Extraction, isolation and characterization of bioactive compounds from plants' extracts. African Journal of Traditional, Complementary and Alternative Medicines. 2011;8(1).
2. Mulanda ES, Awori RM, Chuhila Y, Adero MO, Amugune NO, Akunda E, Kinyamario JI. A DNA-barcode for Melia volkensii Grke (Meliaceae) and its phylogenetic relationship with some economically important relatives. African Journal of Plant Science. 2016 Mar 31;10(3):58-67.
3. Dhiman RC, Dhiman D. Quantification of wood wastage in mechanized match manufacturing.
4. Sood A, Kaur P, Gupta R. Phytochemical screening and antimicrobial assay of various seeds extract of Cucurbitaceae family.
5. Radhika D, Mohaideen A. Fourier transform infrared analysis of Ulva lactuca and Gracilaria corticata and their effect on antibacterial activity. Asian. J. Pharm. Clin. Res. 2015;8:209-12.
6. Edeoga HO, Okwu DE, Mbaebie BO. Phytochemical constituents of some Nigerian medicinal plants. African journal of biotechnology. 2005;4(7):685-8.
7. Vinmathi V, Jacob SJ. A green and facile approach for the synthesis of silver nanoparticles using aqueous extract of Ailanthus excelsa leaves, evaluation of its antibacterial and anticancer efficacy. Bulletin of Materials Science. 2015 Jun 1;38(3):625-8.
8. Loizzo MR, Said A, Tundis R, Rashed K, Statti GA, Hufner A, Menichini F. Inhibition of angiotensin converting enzyme (ACE) by flavonoids isolated from Ailanthus excelsa (Roxb)(Simaroubaceae). Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives. 2007 Jan;21(1):32-6.
9. Albouchi F, Hassen I, Casabianca H, Hosni K. Phytochemicals, antioxidant, antimicrobial and phytotoxic activities of Ailanthus altissima (Mill.) Swingle leaves. South African journal of botany. 2013 Jul 1;87:164-74.
10. Rashed K, Said A, Ahmed M. Antiviral Activity and Phytochemical Analysis of Ailanthus Excelsa Roxb Bark. Journal of Forest Products and Industries. 2013;2(3):30-3.
11. Hitotsuyanagi Y, Ozeki A, Choo CY, Chan KL, Itokawa H, Takeya K. Malabanones A and B, novel nortriterpenoids from Ailanthus malabarica DC. Tetrahedron. 2001 Aug 27;57(35):7477-80.