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FT-IR PROFILE SCREENING OF BIOACTIVE CHEMICAL COMPONENTS IN AQUEOUS EXTRACT OF *ABRUS PRECATORIUS* LINN PLANT LEAF

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ABSTRACT

Objective: The FT-IR profile screening is aimed to focus on the bioactive chemical components analysis of aqueous extract of *Abrus precatorius* Linn plant leafs.

Methods: The profile screening for the bioactive chemical components analysis was performed with standard methods by using FT-IR spectral technique.

Results: The aqueous extract of the leaf were screened for the various bioactive functional chemical components. The spectrum of FT-IR showed the presence different functional groups of chemical constituents such as alcohols, phenols, carboxylic acids, amide, aldehydes, ketones, alkanes, alkenes, aromatics, esters, ethers, aliphatic amines, aromatic amines, peptides, nitro compounds, sulphone, phosphonate, phosphoramide, phosphonic acid, phosphine, silane, amine oxides, aromatic substituted compounds, nitroso, sulphate ester and alkyl halides compounds, which showed 27 major characteristic bands of bioactive chemical components.

Conclusion: The results confirm the fact that leaf of *Abrus precatorius* Linn plant possesses different bioactive functional chemical components and generated the FT-IR spectrum profile for the medicinally important plant.

Keywords: - Abrus precatorius Linn, aqueous extract, FT-IR, chemical constituents.

INTRODUCTION

The various plants are richest resources of bioactive folk medicines. These plants have been traditionally used as different systems of medicine, food supplements, pharmaceuticals industries and chemical entities for synthesis of drugs [1]. The origin place of renewed systems of indigenous medicine like siddha, ayurvedha and unani is India. The medicines were traditionally used were prepared from an only one plant. The activity of medicine depends on the proper parts of plant use and its biological effect which in turn depends on the presence of required quantity dose and nature of secondary metabolite in a raw drug material [2]. The different chemical constituents are detected in crude dry powder of various medicinal plants, while different parts extracts like leaf [3-4], stem, fruits [5] and root [6-7] were screened for phytochemical constituents by FT-IR spectroscopic analysis technique [8]. The different active functional groups of chemical components in various extracts of medicinal plants were detected using spectroscopic method [9-10]. A survey of literature reported that the FT-IR screening of functional groups of chemical components was not done so far with the *Abrus precatorius* Linn medicinal plant. Therefore, the present study used to screen the bioactive functional groups of chemical components in the leaf of *Abrus precatorius* Linn plant.

MATERIAL AND METHODS

Collection of Plant leafs

A leafs of *Abrus precatorius* Linn was collected from the local area and authenticated by our institute botanist. The collected plant leafs were clean and washed with distilled water to remove the dirt and other impurities. The plant leafs was dried at room temperature in shade to retain their fresh green colour and also prevent the decomposition of bioactive chemical compounds. The dried plant leafs were milled to coarse powder and stored in air tight container for screening study.

Extraction of leafs material

A 5 g of leafs powder were extracted with aqueous solvent by Soxhlet apparatus. The extracts were evaporated to dryness and yielded quantities of leaf extracts were obtained and stored at 4^0C for further studies taken to screen the bioactive chemical compounds.

FT-IR screening of aqueous extract

FT-IR is the most powerful tool for identifying the different types of functional groups present in bioactive compounds. The characteristic wavelengths of light absorbed by the chemical bonds can be seen in the annotated spectrum. The infrared absorption spectrum interpretation can be determined the chemical bonds present in a molecules. Dried powder materials of leafs extract was used for FT-IR screening study [11].

A 5 mg of dried powder of the extract was encapsulated in 50 mg of KBr pellet, in order to prepare translucent sample discs. The sample disc was loaded in FT-IR spectroscopy instrument and scanned for a resolution of 4 cm^{-1} with range of 400 to 4000 cm^{-1} [12].

RESULTS AND DISCUSSION

The spectral screening study of *Abrus precatorius* Linn leafs aqueous extract was carried out by FT-IR spectroscopy method. This extract reported 27 characteristic band values with various probable functional groups of bioactive chemical compounds (Fig.-1).

FT-IR spectral data interpretation of aqueous extract

The leafs aqueous extract exhibited characteristic absorption band at 3427.51 cm^{-1} related due to stretching vibrations of alcoholic O-H and phenolic ArO-H groups. The bands at 3375.43 cm^{-1}, 3304.06 cm^{-1}, 3192.19 cm^{-1} and 3178.69 cm^{-1} due to stretching vibration

carboxylic acids RCO-OH, C=C-CO-OH dimer of OH, phenolic ArO-H bond [13], alkynes C-H. The bands at 3128.54 cm^{-1} and 3053.32 cm^{-1} would be related to alkenes =C-H and carboxylic acids RCO-OH, C=C-CO-OH dimer of OH and aromatic Ar-H stretching vibrations. The band 2920.23 cm^{-1} and 2852.72 cm^{-1} due to stretching vibration in alkanes C-H of $-CH_3$, alkanes $-CH_2-$ group and carboxylic acids RCO-OH, C=C-CO-OH dimer of OH; at 2673.34 cm^{-1} due to (O=)PO-H phosphonic acid. The band at 2316.51 cm^{-1} would be due to P-H of phosphine and Si-H of silane. The 1998.99 cm^{-1} band due to N=C in R-N=C=S stretching vibration. The bands 1587.42 cm^{-1} would be due to stretching vibrations in carboxylic acids R-CO-O-, nitroso N=O and aromatic ring Ar-C-C; at 1516.05 cm^{-1} due to aromatic nitro N-O compounds, N=O nitroso and N-O nitro asymmetrical stretching. The band 1379.10 cm^{-1} due to alkanes $-CH_2-$ and $-CH_3$ groups, aliphatic nitro compounds N-O and S=O sulphate ester stretching. The band at 1323.17 cm^{-1} due to alkyl halide C-F, amines Ar-N, S=O sulfone and nitro compound N-O symmetrical stretching. The bands at 1246.02 cm^{-1}, 1213.23 cm^{-1}, 1184.29 cm^{-1}, 1120.64 cm^{-1}, 1074.35 cm^{-1}, 1041.56 cm^{-1} and 1014.56 cm^{-1} could be due to alkyl halides C-F stretching, amines Ar-N stretching, S=O sulfone, amine oxide N-O aromatic, nitro compounds N-O symmetrical stretching, carboxylic acids -C-O- stretching, esters -C-O- stretching, alkyl halides C-H wagging, P=O phosphonate and phosphoramide, P-H phosphine bending, ethers C-O, C=S thiocarbonyl and Si-OR stretching respectively.The band 964.41 cm^{-1} due to P-H phosphine bending, P-O-R esters and N-O amine oxides; at 862.18 cm^{-1} and 840.96 cm^{-1} would be related to aromatic 1,3,5 trisubstituted C-H out of plane, aromatic 1,2,4,5 tetrasubstituted C-H out of plane, S-OR esters, alkenes =C-H out of plane, alkyl halides C-Cl and aromatic para disubstituted stretching; whereas band at 663.51 cm^{-1} due to alkynes C-H bending and alkyl halides R-Br stretching [14].

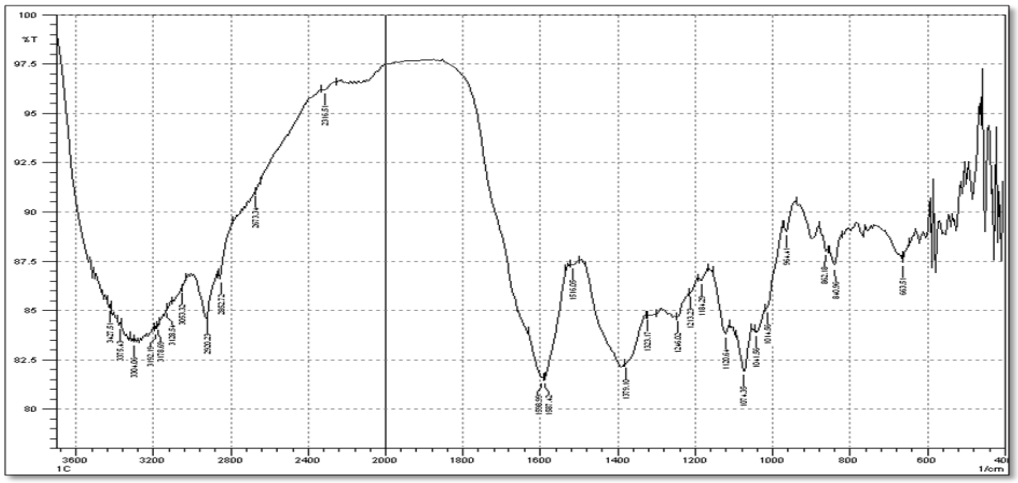

Fig.1: FT-IR spectrum of *Abrus precatorius* Linn leafs aqueous extract

The FT-IR spectrum interpretation data were confirmed the functional constituent's presence in the leaf aqueous extract. The different functional groups observed in the leafs extract probably indicate the presence of various bioactive compounds [15] such as alcohols, phenols, carboxylic acids, amide, aldehydes, ketones, alkanes, alkenes, primary amines, aromatics, alkyl halides, esters, ethers, aliphatic amines, aromatic amines, peptides, nitro compounds, sulphone, phosphonate, phosphoramide, phosphonic acid, phosphine, silane, amine oxides, aromatic substituted compounds, nitroso, sulphate ester and alkyl halides compounds, which showed major characteristic bands of chemical compounds [16].

The result of this screening study coincided with the previously observed observations by various medicinal plant biologist and taxonomist [17-18]. The some of the researchers applied the FT-IR spectrum as a tool mostly for distinguishing closely associated medicinal plants and other organisms [19-26].

CONCLUSION

The result of the screening study presently generated the profile of FT-IR spectrum for novel bioactive chemical compounds marker tool to identify the medicinally important *Abrus precatorius* Linn plant, identify adulterate in the medicinal materials and even evaluate its qualities of medicinal materials. Advanced spectroscopic studies are required further for the structural elucidation and identification of active chemical compounds reported in the leaf aqueous extract.

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