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Research Article

UV-Visible Spectroscopic And FTIR Analysis of Aanai Nerunjil Kudineer - A Siddha Herbal Drug

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ABSTRACT

The Siddha system of medicine is an indigineous system of medicine which belongs to south India. It has a plethora of medications mentioned for numerous diseases. Aim: The present study is the UV-Vis spectroscopic and FTIR analysis of alcoholic extract of Aanai Nerunjil Kudineer, which is a herbal drug indicated for the management of kalladaippu (Urolithiasis) in the textbook Gunapadam mooligai (Pg. no:597).Materials and methods: Aanai Nerunjil (Pedalium murex)plants and Seeds of Kothumalli (Coriandrum sativum)were collected from the locality of Tuticorin, Tamilnadu and were dried under sunshade and ground into coarse powder and then mixed in a 4:1 ratio respectively. UV-Visible spectroscopy can provide a quantitative information on the different phytochemicals present in the sample. FTIR, a qualitative analytical technique can be helpful in identification of the functional groups and naming the compounds in the sample. Results: The presence of absorption peaks between 300nm and 700nm were confirmed by UV-Vis spectroscopy investigation. The presence of carboxylic acid, aromatic compound, alkylhalide, alcohol and alkene functional groups was confirmed by FTIR analysis. Through this study, it can be concluded that Aanai Nerunjil kudineer contains various phytochemical compounds, for proving its efficacy.

INTRODUCTION

The Siddha system of medicine which belongs to the southern part of India practiced till date is an effective method for treating many chronic ailments of mankind. It has various treatment

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methods which prescribes both internal and external modes of treatment derived from herbs, metals and animal origin. One such medication is **Aanai Nerunjil Kudineer** described in the textbook **Gunapadam Mooligai vaguppu**(pg. no:597) indicated for kalladaippu(Urolithiasis).It needs to be prepared as a decoction consisting of coarse powder of Aanai nerunjil(Pedalium murex *Linn.*)and Kothumalli(Coriandrum sativum *Linn.*)seeds in a 4:1 ratio.

Ultraviolet-Visible spectroscopy, one of the most commonly used techniques in pharmaceutical analysis is a spectrophotometry which involves measuring the quantity of UV absorbed by a chemical in solution. UV-Visible spectrophotometers are instruments that measure the ratio or function of the intensity of two beams of light in the UV-Visible area. In qualitative analysis, organic compounds can be identified by use of spectrophotometer, if any recorded data is available and quantitative spectrophotometric analysis is used to ascertain the quantity of molecular species absorbing the radiation. Spectrophotometric technique is simple, rapid, moderately specific and applicable to small quantities of compounds[1].

Fourier Transform Infra-Red(FTIR) spectroscopy is one of the most extensively used technologies for identifying chemical constituents and elucidating compound structures, and it is required for identifying medicines in many Pharmacopoeias[2].FTIR can be used to find out the structure of unknown compositions as well as the intensity of absorption spectra related to molecular composition or chemical group content[3,4].The FTIR method provides a spectrum that can be considered as a biochemical or metabolic "fingerprint" of the sample by measuring the vibrations of bonds within chemical functional groups.This may be able to detect minor changes in primary and secondary metabolites by obtaining IR spectra from plant samples[5].FTIR is presently to be used to detect the concrete structure of certain plant secondary metabolites, particularly in phytochemistry[6].Preliminary Phytochemical Properties of *Pedalium murex* showed the presence of alkaloids, saponins, tannins, flavonoids, sugar, glycosides, phenols, sterols[7]and of *Coriandrum sativum* revealed the presence of phenols and flavonoids[8].

MATERIALS AND METHODS

Collection of Raw Materials

The Raw materials (*Pedalium murex linn.* Plants and *Coriandrum sativum linn*. Seeds) were collected from the locality of Tuticorin district, Tamilnadu. They were authenticated by the Experts of Gunapadam department, Government Siddha Medical College&Hospital, Palayamkottai-627002.The raw drugs were purified and shade dried and ground into coarse powder and mixed well. It is stored in airtight containers and preserved for future use.

Ultra Violet-Visible (UV-Vis) spectroscopy

The alcohol extract of the drug was subjected to Ultra Violet-Visible spectroscopic analysis. The extract was scanned at wave length ranging from 200 to 900 nm using UV-VIS spectrophotometer (Model: UV3120) and the characteristic peaks were detected and recorded.

FTIR Spectroscopy

The drug was subjected to FT-IR analysis using KBr pressed disk technique on Analytical Technologies FT-IR spectrophotometer (Model: INFRA 3000-50) and the characteristic peaks were detected and recorded.

RESULTS

The UV-Vis spectrum of alcoholic extract of Aanai Nerunjil Kudineer was selected from 200 to 900nm.It showed the presence of peaks at 315nm & 430nm with absorption of 3.2240 & 4.118 respectively (Fig.1).

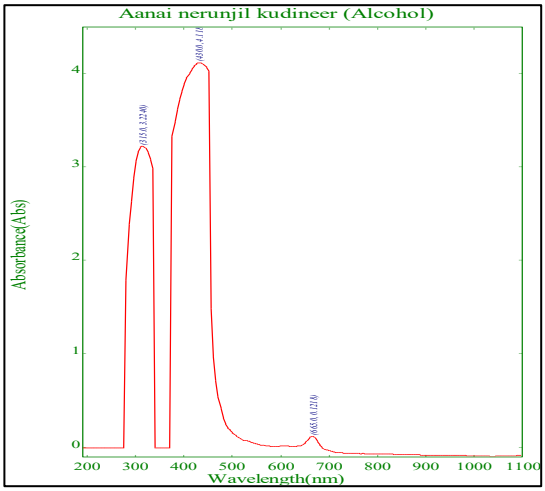

Fig.1 UV-Vis spectrum of alcoholic extract of Aanai Nerunjil Kudineer

The FTIR Spectrum profile used to identify the functional groups in a compound, is calculated based on the peak values in the infrared region. when the extract is passed through the FTIR, the functional groups are separated based on their peaks. The peaks and functional groups are represented in table 1. The FTIR spectrum is represented in Fig.2.A peak at 2924 cm^{-1} shows the presence of O-H Stretching. A broad peak at 1657 cm^{-1} shows –C=C- stretching due to carboxylic acid, whereas peaks at 1423,1265 cm^{-1} shows the presence of C-C & C-N stretching due to aromatic compounds respectively. A wide peak at 1032 cm^{-1} attributes to C-O stretching due to the presence of alcohol while peaks around 876&675 cm^{-1} are due to =C-H bendings respectively. A sharp peak at 517cm^{-1} showed the presence of alkyl halide stretching. Since there was no absorption between 2220-2260 cm^{-1} there is no cyanide group presence, which is a toxic substance. The FTIR spectrum confirms the presence of alcohol, alkenes, alkyl halides, carboxylic acids, aromatic compounds and amines.

Table 1. FTIR peak values and functional groups in alcoholic extract of Aanai Nerunjil kudineer

S.No	Wave Number (cm^{-1})	Intensity estimation	Functional group	Type of vibration	Possible compounds
1	517	medium	C-Br	stretch	alkyl halide
2	675	small	=C-H	bend	alkene
3	876	small	=C-H	bend	alkene
4	1032	strong	C-O	stretch	alcohol
5	1265	medium	C-N	stretch	Aromatic amine
6	1423	medium	C-C	stretch	aromatic
7	1657	medium	-C=C-	stretch	alkene
8	2924	strong	O-H	stretch	carboxylic acid

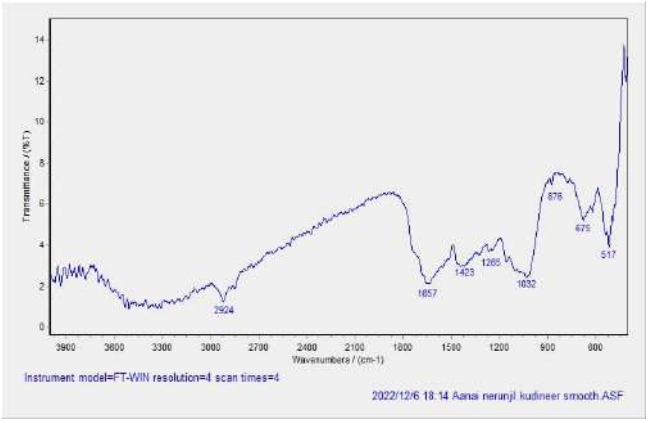

Fig.2 FTIR Spectrum of alcoholic extract of Aanai Nerunjil Kudineer

DISCUSSION

Secondary metabolites fingerprinted by chromatography and spectroscopy provide valuable information about the qualitative and quantitative formulation of plant species. The UV-VIS spectroscopy offers a simple, technique to identify the main phytochemicals, discriminating between the lipophilic and hydrophilic molecules in relation to the polarity. Spectroscopic (UV VIS, FTIR) methods together or separate can be used in this sense as well as conventional methods [9]. Fourier Transform Infrared Spectroscopy (FTIR) is a high-resolution analytical technique to identify

the chemical constituents and elucidate the structural compounds[10].

The FTIR Fingerprint revealed the presence of flavonoids due to O-H stretching, terpenes due to C-H stretching. The FTIR spectrum confirms the presence of alcohol, alkenes, alkyl halides, carboxylic acids, aromatic compounds and amines. The presence of flavonoids[11] and terpenes[12]may be responsible for the therapeutic activity of the drug Aanai Nerunjil Kudineer.

CONCLUSION

In the present study UV-VIS spectrum and FTIR analysis of alcoholic extract of Aanai Nerunjil Kudineer showed the presence of phenolic compounds, terpenes and flavonoids which are responsible for the pharmacological properties of the drug. Further, this compound can be isolated& further screened for different kind of biological activities depending on their therapeutic uses. Further research will be needed to find out the structural analysis of flavonoid compounds by use of different analytical methods such as NMR and Mass spectrophotometer.

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