Vol 5 Issue 6 July 2015

ISSN No : 2230-7850

International Multidisciplinary Research Journal

Indian Streams Research Journal

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RNI MAHMUL/2011/38595 **ISSN No.2230-7850**

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Indian Streams Research Journal
ISSN 2230-7850

Impact Factor : 3.1560(UIF)
Volume - 5 | Issue - 6 | July - 2015

PHYTOCHEMICAL AND FTIR ANALYSIS OF DIFFERENT COMMON MEDICINAL PLANT

Aparna. A. Bhairappa and Aditi S. Hiraskar

ABSTRACT

Methanolic extract of four medicinal plants Ricinus communis, Prunus dulkis, Ficus racemosa, Kalanchoe pinnata, Ocimum gratissimum, were subjected to phytochemical screening. A quantitative phytochemical analysis of flavonoids, tannins, proteins, steroids, and terpenoids was performed. Among above four test plants Ficus racemosa and Ocimum gratissimum showed maximum positive results for quantitative analysis of phytochemical. FTIR screening from range 400 to 4000 cm-1 was done with methanolic plant extract for functional group analysis. Maximum functional group was observed in Ficus racemosa as compared to other remaining test plants.

KEYWORDS :*Phytochemical assay, FTIR screening, Medicinal plant,*

Short Profile

Aparna. A. Bhairappa is working as a Assistant profressor at Department of Biotechnology in Walchand College of Arts and Science, Solapur.

INTRODUCTION

Review of literature:

The value of medicinal plant in today's world is that they become a potential source for bioactive compounds. The chemicals obtained from medicinal plant are known as phytochemicals serve as lead compounds in drug discovery and design. Medicinal plants are valuable for getting novel drugs that forms the ingredients in traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates, bioactive principles and lead compounds in synthetic drugs.

Infrared spectroscopy is an important technique in organic chemistry. It is an easy way to identify the presence of certain functional groups in a molecule. Also, one can use the unique collection of absorption bands to confirm the identity of a pure compound or to detect the presence of specific impurities.

World Health Organization pointed out that more than 80% of world's population depends on plants for primary health care needs. In recent years, multiple drug/ chemical resistance in both human and plant pathogenic microorganisms has been developed due to indiscriminate use of synthetic drugs. This drives the need to screen medicinal plants for novel bioactive compounds as they are biodegradable, safe and have fewer side effects (Prusti A.et.al.2008). Hence, the objective of the study was to assess the phytochemical properties of the locally grown Ricinus communis, Prunus dulkis, Ficus racemosa, Kalanchoe pinnata,Ocimum gratissimum.

Methods:

Plant material:

The plants were collected from different localities of Solapur, Maharashtra. fresh plat material were washed under running tap water, air dried for three to four weeks, homogenized to fine powder in mechanical grinder and stored

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in air tight bottles.

Plant extraction: Methanolic Powdered plant sample were soaked in methanol for 48 hrs, filletered and the solvent removed in evaporator at a temperature below 400C. Extracts are stored in sample bottles in the refrigerators prior to use. (Nonita P. Peteros et.al., 2010)

Qualitative analysis on phytochemical constituents (K. Karthishwaram et. al.)

Test for flavonoids: A few drops of 1% NH3 solution is added to the methanolic extract of plant leaves in a test tube. A yellow coloration is observed if flavonoids compounds are present.

Test for tannins: The 0.5 g of powdered sample of plant leaves is boiled in 20 ml of distilled water in a test tube and then filtered. The filtration method used here is the normal method, which includes a conical flask and filter paper. The 0.1% FeCl3 is added to the filtered samples and observed for brownish green or a blue black coloration, which shows the presence of tannins.

Test for proteins: To a small amount of methanolic leaves extract, 5-6 drops of Million's reagent was added. A white precipitate which turns red on heating was formed and it is indicates the presence of proteins.

Test for steroids: One milliliter of the extracts was dissolved in 10 ml of chloroform and equal volume of concentrated sulphuric acid was added by sides of the test tube. The upper layer turns red and sulphuric acid layer showed yellow with green fluorescence. This indicated the presence of steroids.

Test for terpenoids: Five milliliter of methanolic extract is mixed with 2 ml of CHCl3 in a test tube. Three milliliter of concentrated H2SO4 is carefully added to the mixture to form a layer. An interface with a reddish brown coloration is formed if terpenoids constituent is present.

Phytochemical screening by FTIR:

Fourier transform infrared (FTIR) was used to identify the characteristic functional groups in the extract. A small quantity (5 mg) of the extract was dispersed in dry potassium bromide (KBr). The mixture was thoroughly mixed in a mortar and pressed at pressure of 6 bars within 2 min to form a KBr thin disc. Then the disc was placed in a sample cup of a diffuse reflectance accessory. The IR spectrum was obtained using Perkin Elmer 2000 infrared spectrometer. The sample was scanned from 4000 to 400 cm-1 for 16 times to increase the signal to noise ratio. (Pramila et al.)

Result and Discussion:

Qualitative analysis of phytochemicals.

Plants phytochemicals	*Ficus rasmosa*	*Almond*	*Kalanchoe pinnata*	*Ocimum gratissimum*
Tanin	Present	Present	Present	Present
Proteins	Present	Present	present	Present
Steroids	Present	Absent	Present	Present
Terpenoids	Present	Present	Absent	Present
Flavonoids	Present	Present	Present	Present
Quinine	Present	Present	Present	Present

Using above methodology qualitative analysis of phytochemical i.e. tannin, protein, steroid, flavonoids, terpenoids and quinine was done. From these tannin, protein, flavonoids and quinine were major phytochemicals present in all four test medicinal plant. While Almond and Kalanchoe pinnata shows absence of steroids and terpenoids respectively.

Functional group screening by FTIR analysis:

FTIR spectra of Almond:

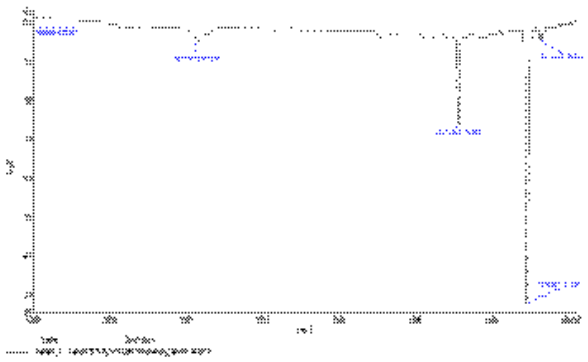
The IR spectra for Almond leaf extract in the KBr pallet is shown in figure . The detailed information was listed in table n. The absorption at 1219.54cm^{-1} is due to the P=O that are present in the extract. The bond at 2925.43cm^{-1} and

684.27cm^{-1} due to alkine and amide respectively. The bond at 772.38cm^{-1} is assigned to the ester of S-OR, with strong intensity of bond.

FTIR results of Almond

Absorption in cm^{-1}	Functional group	Bond present
1219.54	Phosphoramide	P=O
2925.43	Alkane	CH_3,CH_2, CH
772.38	Ester	S-OR
684.27	Amine	NH_2,NH

FTIR screening of Almond



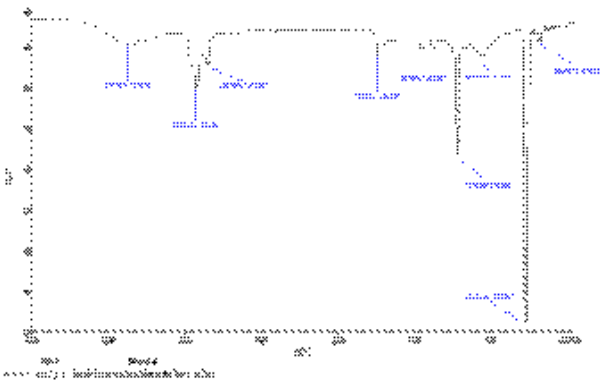
a.FTIR spectra for Ficus rasmosa:

The IR spectra for Ficus rasmosa leaf extract is given in figure and information is listed in table. The absorption at 3367.37cm^{-1} is due to phenol and alcohol groups present in extract. There are three absorption points coded for carboxylic acid and their derivatives, these are 2925.15cm^{-1}, 2853.84cm^{-1}, 1736.79cm^{-1}. The peak at 1446.59cm^{-1} is for S=O bonding. The 1219.52cm^{-1} and 1061.87cm^{-1} assigned for thiocarboxyl and amines with bond C=S and C-N respectively. The last peaks are with 772.31cm^{-1} and 684.41cm^{-1} coding for ester and alcohol and phenol with S-OR and OH bond with bandings.

FTIR results of Ficus rasmosa

Absorption in cm^{-1}	Functional group	Bond present
3367.37	Alcohol & Phenols	C-O
2925.15	Carboxylic acid & derivatives	OH
2853.84	Carboxylic acid & derivatives	CO
1736.79	Carboxylic acid & derivatives	
1446.59	Sulphate	S=O
1219.52	Thiocarboxyl	C=S
1061.87	Amines	C-N
772.31	Ester	S-OR
684.41	Alcohol and Phenols	OH bend

FTIR screening of Ficus rasmosa



b.FTIR spectra for Kalanchoe pinnata:

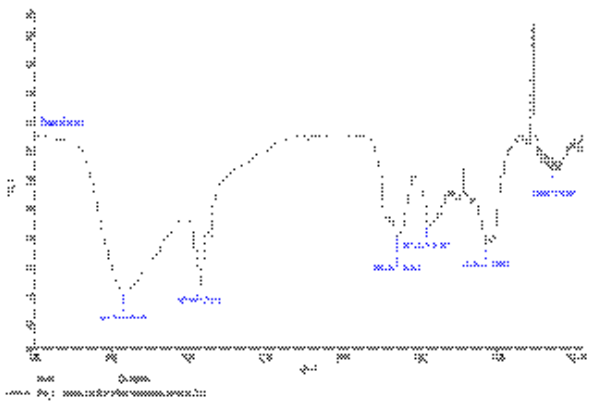
The IR spectra of KBr pallet of Kalancheo pinnata was shown in figure and information

listed in table . This plant contains mainly two functional groups of different compounds these are amines and alkanes representing different bonds. Amine groups are coded by 3412.21cm^{-1} and 1078.98cm^{-1} with N-H and C-N bonding respectively. The other four absorptions are allotted for alkanes which are 2925.25cm^{-1}, 1660.12 cm^{-1}, 1457.10 cm^{-1}, 624.26 cm^{-1} with bonds CH_3, CH_2, CH respectively.

FTIR results of Kalancheo pinnata

Absorption in cm^{-1}	Functional group	Bond present
3412.21	Amines	N-H
2925.25	Alkanes	CH_3,CH_2,CH
1660.12	Alkanes	C=C
1457.10	Alkanes	CH_2,CH_3
1078.98	Amines	C-N
624.26	Alkanes	C-H

FTIR screening of Kalancheo pinnata.



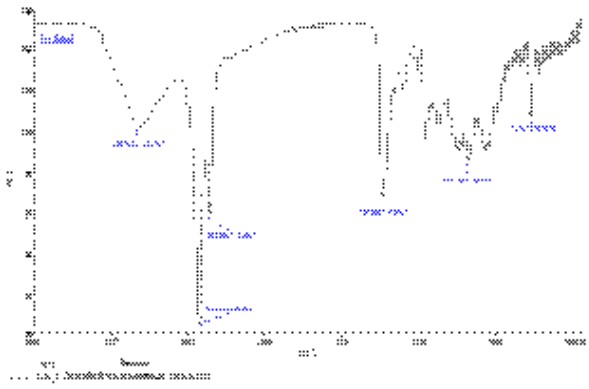
c.FTIR spectra for Ocimum gratissimum:

IR spectra for above plant are given in figure and information listed in table. The plant leaf extract contain various functional groups. The absorption at 3329.14 cm^{-1} is due N-H bond of amine group. The 2928.54 cm^{-1} and 2854.54cm^{-1} absorption codes for the CH_3, CH_2, and CH bonding of alkane group with strong intensity. 1738.93 cm^{-1} absorption indicates aldehyde and ketone group with C=O bonding. The last two absorption are 1175.29 cm^{-1} and 779.59 cm^{-1} assigned to phosphate and ester bonds with strong intensity.

FTIR results of Ocimum gratissimum

Absorption in cm^{-1}	Functional group	Bond present
3329.15	Amines	N-H
2928.54	Alkanes	CH_3
2854.54	Alkanes	CH_3,CH_2, CH
1738.93	Aldehyde and Ketone	C=O
1175.29	Phosphate	P=O
775.59	Ester	S-OR

FTIR screening of Osimum gratissimum.



CONCLUSION:

The present study showed the presence of tannins, proteins quinines, steroids and flavonoids in the Ricinus communis, Prunus dulkis, Ficus racemosa, Kalanchoe pinnata, Ocimum gratissimum Plant extract. A correlative

relationship has been reported between the phytochemicals such as tannins and flavonoids and the free radical scavenging activity (Kaur et al., 2010). Tannins and flavonoids have therapeutic uses due to their anti-inflammatory and healing properties (Thiago et al., 2008). Due to the presence of tannin in methanolic extract Ricinus communis, Prunus dulkis, Ficus racemosa, Kalanchoe pinnata,Ocimum gratissimum attributable to the presence of antibacterial and antifungal activity . Ricinus communis, Prunus dulkis, Ficus racemosa, Kalanchoe pinnata, Ocimum gratissimum could be a possible alternative to chemicals as it can be harnessed as antibacterial, antioxidant etc.

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