



IJPPR

INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals

ISSN 2349-7203



Human Journals

Research Article

August 2020 Vol.:19, Issue:1

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Phytochemical, Antibacterial and FTIR Spectroscopic Analysis of *Pistacia integerrima* Galls against Some Multi Drug Resistance Bacteria

	IJPPR INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH An official Publication of Human Journals	ISSN 2349-7203 
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Submission:	21 July 2020	
Accepted:	28 July 2020	
Published:	30 August 2020	

Keywords: Phytochemical, Antibacterial and FTIR Spectroscopic Analysis, *Pistacia integerrima*

ABSTRACT

The present study is aimed to analyse the Methanol, Ethanol, Pet. Ether, Chloroform and Aqueous extracts of galls of *P. integerrima* plant. The method used for detection of antibacterial testing was Well Diffusion Methods. The effective methanol extract only tested through FTIR spectroscopy method. The FTIR spectroscopic studies revealed different characteristic peak values with various functional compounds in the extracts. The FTIR analysis of methanol extracts of *P. integerrima* galls confirmed the presence of aromatic compounds, alkali halides, nitro compound, phenols, aliphatic compounds, which showed major peaks. The FTIR method was performed on a spectrophotometer system, which was used to detect the characteristic peak values and their functional groups. The results of the present study generated the FTIR spectrum profile for the medicinally important plants of present study can be used in the pharmaceutical industries for drug preparation.



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INTRODUCTION

Pistacia integerrima (Anacardiaceae), is well-known medicinal plant, commonly known as kakarsinghi. *P. integerrima* as a medium sized deciduous tree that can achieve a height of 50 feet distributed in the eastern Himalayan ranges from Indus to Kumaon. *P. integerrima* is used as a folk medicine for treatment of different ailments including; hepatitis, liver disorder, anti-inflammatory, antidiabetic agent, blood cleanser, gastrointestinal disorders, cough expectorant, jaundice, stomach aches, fever and diarrhea. (Uddin G., 2011; Chopra RN.1982).

P. integerrima comprise various active phytochemicals includes pistagremic acid (P.A), pisticialanstenic acid, n-octadecan-9, 11-diol-7-one, hydroxydecanyl arachidate, pistiphlorogluciny ester, 2, pistaciaphenyl ester, and pistiphlorogluciny ether. The present review studies about antibacterial and FTIR analysis of methanol extract of *P. integerrima* profiling of *P. Integerrima*. (Anonymous 1998).

Botanical description: *Pistacia integerrima* belongs to family Anacardiaceae and a native dioecious tree to China, Japan, Pakistan, Afghanistan, and India (Pant and Samant, 2010). *Pistacia integerrima* is well prominent due to Galls that present on the leaves and petioles. These galls are like animals horn shaped. The galls are the storehouse of various secondary metabolites so; it has importance in Indian traditional medicine systems (Chopra *et al.*, 1986).

P. integerrima tree has dense crown based and roots are deeply inserted in soil, with Single stemmed. The leaves 10 inch long and 4 inch broad, they are ovate shaped and are present in pairs. The Leaves are pinnate and bearing 2 to 6 pairs of lanceolate, long leaflets. The terminal leaflet is much smaller than the lateral ones, inflorescence was red. The fruit are shiny, globular, apiculate and 6 to 8 cm in diameter. The fruit arises in early summer, brown in colour and become purplish or blue at maturity. The fruit have bony endocarp and after maturity followed by fruiting. (www.worldagroforestrycentre.org; www.sciencedirect.com)



Figure No. 1:

Galls of *Pistacia integerrima*

The galls are horn-like excrescences caused by a kind of insects (aphis) on the leaves, petioles and branches. They are hard, hallow, thin-walled, generally cylindrical, tapering to either extremity on breaking open the galls, a reddish inner surface is seen and appears to be covered with dust but actually the debris of the insects and their excretory substance. (Chopra and Ghos 1926;1929).

Pharmacological properties: The active phytoconstituents isolated from *P. integerrima* extract showed good antioxidant activity. The flavonoids and phenolic compounds present in the extracts of *P. integerrima* leaves have significant radical scavenging and xanthine oxidase inhibitory activity. (Ahmad NS 2008) The antiradical properties of crude extract and various isolated fraction may due to the presence of phenolic compounds present in the extract. (Rauf A., 2012).



Figure No. 2:

Galls of *P. integerrima*

Fourier Transform Infrared Spectrophotometer (FTIR)

Fourier Transform Infrared Spectrophotometer (FTIR) is the most powerful technique for identifying the types of chemical bonds (functional groups) present in compounds. The wavelength of light absorbed is characteristic of the chemical bond as can be seen in the annotated spectrum. By interpreting the infrared absorption spectrum, the chemical bonds in a molecule can be determined.

Dried powder of different solvent extracts of selected plant material was used for FTIR analysis. About 5 mg of the dried extract powder was encapsulated in 100 mg of KBr pellet, in order to prepare translucent sample discs. The powdered sample of Pistacia galls was loaded in FTIR spectroscope (Shimadzu, IR Affinity 1, Japan), with a Scan range from 4000cm⁻¹ to 400cm⁻¹ a resolution.

Antibacterial activity

The agar well diffusion method was performed to exploit antibacterial potential of used extracts. Each extract (200 mg) was dissolved in 10 mL of 99.9% dimethyl sulfoxide (DMSO) (Sigma-Aldrich USA) to get 20 mg/mL concentration. Streptomycin (2 mg/mL) in DMSO was prepared as positive control. Pure DMSO (99.9%) was used as negative control.

Procedure

Nutrient agar medium was prepared by suspending nutrient agar (Merk) 20 g/L in distilled water. The pH value of the media was adjusted to 7.0, autoclaved, and allowed to cool up to 45°C. The media was seeded with 10 mL prepared inocula. Subsequently, the seeded medium (75-80 mL) was poured into pre-labeled Petri plates (diameter = 14 cm) and allowed to solidify. Required numbers of wells per plate (six wells for extracts, one for positive and negative control each) were made with 8 mm sterile cork borer. These wells were sealed by pouring 20 µl of liquid nutrient agar medium in each well. With the help of micropipette, 100 µl of test solution was poured into respective well.

Sample of extracts, one positive control (Streptomycin), and one negative control (DMSO) were applied to each Petri plate. Then the plates were incubated at 37°C. After 24 hr of incubation period, diameter of clear zones around each well was measured, showing anti

bacterial growth. In this study, triplicate plates were prepared for each extract and bacterial strain. The mean zone of inhibition was calculated. *Pistacia integerrima* represents one of those plants having broad-spectrum activities (Yamin B, *et al.*, 2015).

RESULTS AND DISCUSSION:

The galls of *P. integerrima* showed good antibacterial activity.



Figure No. 3: Antibacterial Activity of *P. integerrima* galls.

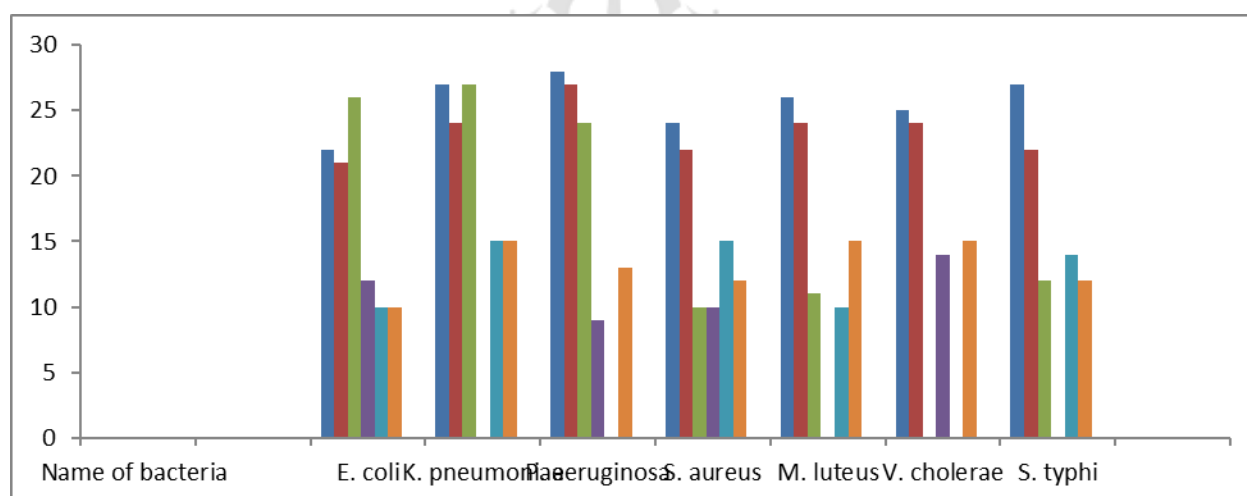


Figure No. 4: The graph showing Antibacterial Activity of *P. integerrima* galls.

The antibacterial activity showed in methanol extracts of *P. integerrima* here it showed excellent antibacterial activity. The Pet. ether extract also showed good antibacterial activity against *E. coli* bacteria. The ethanol and methanol extracts showed almost equivalent antibacterial activity against *S. aureus*. The chloroform extract does not show any antibacterial activity against *P. aeruginosa* and *M. luteus*. The chloroform extract also inefficient against *S. typhi* bacteria. The negative control DMSO showed nil inhibition zones

in present finding. The positive control used here was Streptomycin. The methanol extracts showed better result than that of streptomycin also.

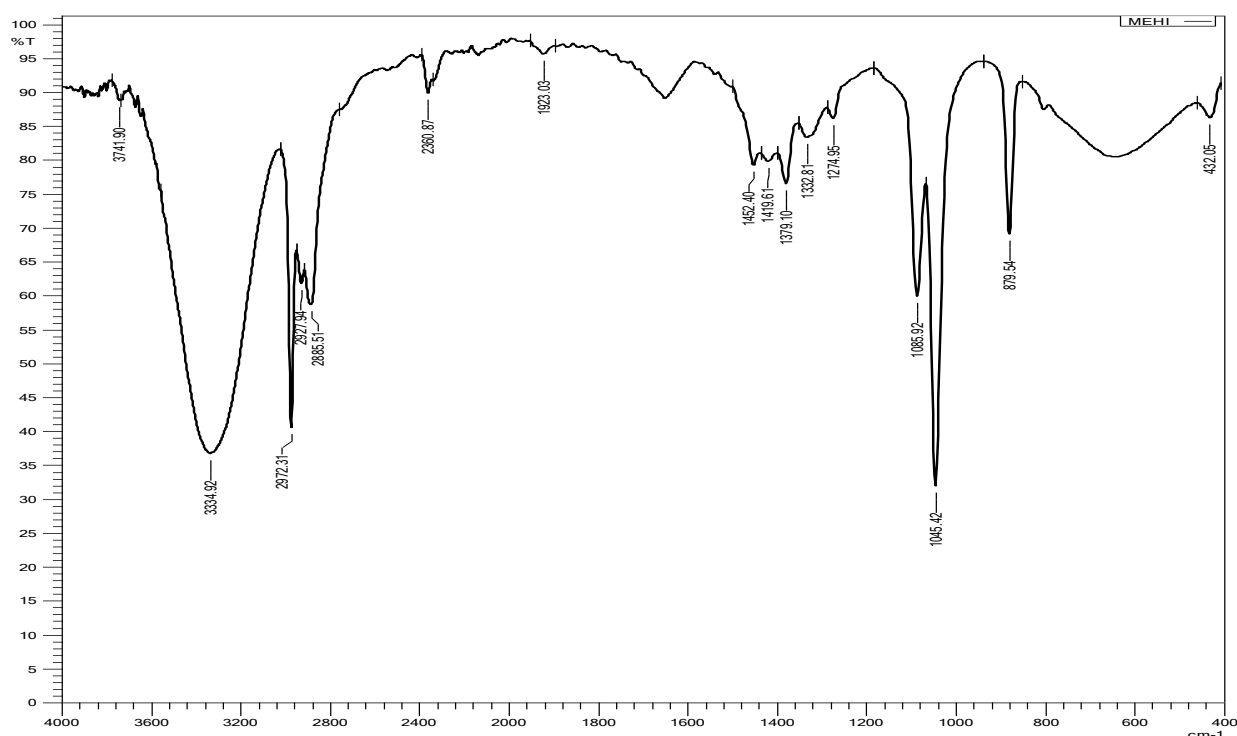


Figure No. 5: The FT-IR Spectrum of Methanol extract of *P. integerrima*

Table No. 1: FT-IR Analysis of *P. integerrima*

Sr. No.	Peak Value[cm ⁻¹] sample	Wave number [cm ⁻¹] Refrence	bonds	Functional group assignment	Phytochemicals identified
1	879.54	900-675(S)	C-H	C-H “oop”	Aromatic compounds
2	1045.42	1250-1020 (M)	C-N	C-N stretch	Aliphatic amines
3	1274.95	1300-1150 (M)	C-H	C-H wagging	Alkyl halides
4	1332.81	1335-1250 (S)	C-N	C-N stretching	Aromatic amines
5	1379.1	1360-1290 (M)	N-O	N-O symmetric stretching	Nitro compounds
6	1452.4	1470-1450 (M)	C-H	C-H bending	Alkanes (C _n H _{2n+1})

CONCLUSION

The *Pistacia integerrima* is a good candidate for new drug development inspite of wide range of its phytochemicals and bioactivities compounds from its traditional uses. There is a dire

need to further explore and standardize the medicinally important species up to clinical trials level.

CONFLICT OF INTEREST: Nil

FUTURE PERSPECTIVE: To study and elucidate pure compound which is responsible for this potent activity.

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