

Original Research Article

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FT-IR Spectroscopic Studies on Flowers of *Allamanda neriifolia* Hook

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ABSTRACT

Keywords

FT-IR, *Allamanda neriifolia* hook, Functional groups, and Bioactive compounds.

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The present study was carried out to investigate the methanolic extracts of flowers of *Allamanda neriifolia hook* through FT-IR spectroscopy method. The FT-IR spectroscopic studies revealed different characteristic peak values with various functional compounds in the extracts. The FT-IR analysis of methanolic extracts of *Allamanda neriifolia hook* confirmed the presence of phenols, alkanes, alkynes, aromatics, aromatic and aliphatic amines and alkyl halides which showed a major peak values. The FT-IR method was performed on a spectrophotometer system, which was used to detect the characteristic peak values and their functional groups.

Introduction

Medicinal plants play a pivotal role in the health care of ancient and modern cultures. Ayurveda, the Indian system of medicine mainly uses plant based drugs or formulations to treat various human ailments because they contain the components of therapeutic value. In addition, plant based drugs remain an important source of therapeutic agents because of the availability, relatively cheaper cost and non-toxic nature when compared to modern medicine (Nithya Narayanaswamy and Balakrishnan, 2011; Agbor and Ngogang, 2005).

Plants are an important source of organic antioxidant chemicals which are widely

used as ingredients in dietary supplement (Chaturvedi *et al.*, 2015; Sowndharajan *et al.*, 2011). Medicinal plants are of great importance to health of individuals and communities in general. The medicinal value of plants lies in some chemical substances that produce a definite physiological action on the human body (Puguh Surjowardojo, *et al.*, 2014). Plants are endowed with various phytochemical molecules such as vitamins, terpenoids, phenolic acids, lignins, stilbenes, tannins, flavonoids, quinines, coumarines, alkaloids, amines, betalains and other metabolites which are rich antioxidant activity. These antioxidant compounds possess anti-inflammatory, anti-

atherosclerosis, antitumour, antimutagenic, anticarcinogenic, antibacterial and antiviral activities (Herin Sheeba Gracelin *et al.*, 2013).

The family Apocynaceae consists of several important medicinal plants with wide range of biological activities and interesting phytochemical constituents. *Allamanda neriifolia* Hook commonly known as the Yellow Bell, Golden Trumpet or The Buttercup flower is a genus of tropical shrubs and vines belonging to the family Apocynaceae. It has been used as a purgative or emetic, febrifuge as well as for the treatment of coughs, headaches, jaundice and enlarged spleen resulting from malaria. The milky sap is also known to possess antibacterial and possibly anticancer properties (Tiwari TN *et al.*, 2002).

Fourier Transform Infrared (FTIR) Spectroscopy is a rapid, noninvasive, high-resolution analytical tool for identifying types of chemical bonds in a molecule by producing an infrared absorption spectrum that is like a molecular fingerprint (Griffiths and De Haseth, 1986). FTIR has been shown to be a valuable tool for differentiating, classifying and discriminating closely related microbial strains, plants and other organisms (Helm *et al.*, 1991). It is one of the most widely used methods to identify the chemical constituents and elucidate the structural compounds and has been used as a requisite method to identify medicines in Pharmacopoeia of many countries.

Preliminary phytochemical studies and GC-MS analysis were already done by using this plant. Within a decade, there were a number of dramatic advances in analytical techniques, including FT-IR and GC-MS that were powerful tools for identification and determination of phytochemicals (Roberts and Xia, 1995). The present study

was carried out to find out the active functional groups present in the flowers *allamanda neriifolia hook* in methanol extract with the aid of FT-IR techniques, which may provide an insight in its use of traditional medicine.

Methods and Materials

Collection of Plants

The selected medicinal plant *Allamanda neriifolia hook* was collected from Thiruvarur (Dt), Tamil Nadu, India. The flower was first washed well and dust was removed from the flower and were dried at room temperature. These dried materials were macerated to powder form with a mixer grinder and stored in air tight container for further use.

Preparation of Extracts

The coarsely powder was packed into soxhlet column and extracted with 70% methanol for 48 hours (64.5-65.5°C). The extract was concentrated under reduced pressure (bath tem 50°C) then the dried extract was stored in air tight container for further use.

FT-IR Spectroscopic Analysis

Fourier transform infrared spectrophotometer (FTIR) is perhaps the most powerful tools for identifying the types of chemical bonds (functional groups) present in compounds. Dried powders of different solvent extracts of each plant material were used for FTIR analysis. 10mg of the dried extract powder was encapsulated in 100 mg of KBr pellet, in order to prepare translucent sample disc. The powdered sample of each plant specimen was loaded in FTIR Spectroscope (Shimadzu, IR Affinity1, Japan), with a scan range from 400 to 4000

cm⁻¹ with a resolution of 4cm⁻¹ (Nithyadevi and Sivakumar., 2015).

Results and Discussion

FTIR analysis was used to identify the functional group of active components

based on peak values in the region of infrared radiation. FTIR spectrum was analyzed and the results of FTIR spectrum profile was illustrated in the Fig 1, and tabulated in Table 1.

Table.1 FT-IR Peak Values of flowers of *Allamanda neriifolia* hook

S.No	Peak value frequency cm ⁻¹	Bond	Functional group
1	3370.98	O-H stretch	Alcohols/ Phenols
2	2926.73	C-H stretch	Alkanes
3	2364.22	-	Unknown
4	2128.13	-C=C-stretch	Alkynes
5	1642.56	N-H bend	Primary amines
6	1407.99	C-C stretch	Aromatics
7	1324.36	C-N stretch	Aromatic amines
8	1242.43	C-Br stretch	Alkyl halides
9	1051.88	C-N stretch	Aliphatic amines
10	771.27	NH bending	Amines
11	616.80	-C(triple bond) C-H:C-H bend	Alkynes

Fig.1 Shows the FT-IR spectrum of *allamanda neriifolia* hook

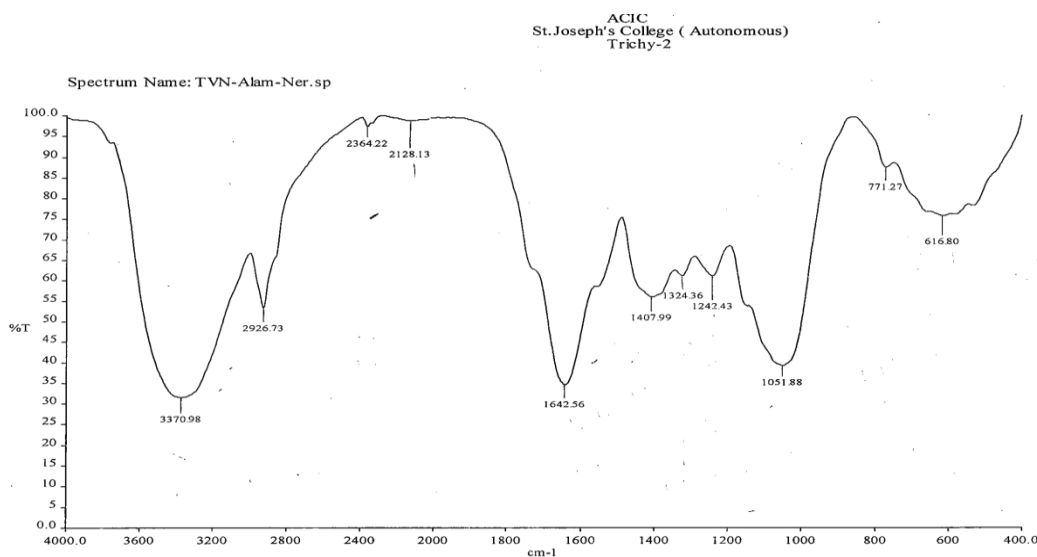


Fig 10: FTIR Spectrum of flowers of *Allamanda neriifolia* hook

FTIR spectroscopic analyses was first reported on *A.neriifolia* revealed the presence of different functional groups of the bioactive compounds present in the *A.neriifolia* methanolic flower extract in the form of peaks. The functional groups were separated based on its peak ratio. The results of ftir spectrum shows a frequency range 3370.98cm^{-1} representing the OH stretching and indicated the presence of alcohol and phenol. The peak obtained at 2926.73cm^{-1} indicated the C-H stretching presence of alkanes. The peak obtained at 2128.13cm^{-1} and 616.80cm^{-1} indicated the $-\text{C}=\text{C}-$ stretching and $-\text{C}$ (triple bond) C-H: C-H bend and mainly the presence of alkynes. The peak obtained at 1642.56cm^{-1} indicates the N-H bending presence of primary amines. The peak obtained at 1407.99cm^{-1} indicates the C-C stretching presence of aromatic compound. The frequency range 1324.36cm^{-1} peak is representing C-N stretching indicated the presence of aromatic amines. The peak obtained at 1242.43cm^{-1} indicates the C-Br stretching presence of alkyl halides. The peak obtained at 1051.88cm^{-1} indicate the C-N stretching confirm the presence of aliphatic amines. The peak obtained at 771.27cm^{-1} indicates the N-H bending presence of amines.

Among the functional groups observed in the extracts, OH group was found to be present uniformly only in the methanolic extracts. As OH group has got the ability of forming hydrogen bonding capacity, presence of OH group probably indicates the higher potential of methanolic extract towards inhibitory activity against microorganisms. So, FT-IR spectrum reflecting objectively the panorama of chemical constituents in complex system is a most credible method to validate and identify the mix-substance systems such as traditional medicine and herbal medicine

(Liu *et al.*, 2006). The results of the present study spectrum also revealed the functional constituents present in the crude powder of *A. neriifolia hook*.

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