

## Fourier transform infrared spectroscopy analysis of *Sauromatum venosum* (Ait.) schott. Tuber extract for alkaloids

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### Abstract

Alkaloids are one of the largest groups of plant secondary metabolites; represent a highly diverse group of chemical entities. Plants are considered pharmacologically active when they contain alkaloids which could be of benefit to health. The FTIR spectroscopic analysis of *Sauromatum venosum* (Ait.) Schott. tuber extract for alkaloids revealed the presence of different characteristic peak values of alkaloids with various functional compounds in the extracts. The FTIR analysis of *Sauromatum venosum* (Ait.) Schott. tuber extract confirmed the presence of Ar-OH stretching, -CH<sub>3</sub> stretching, Ar-H stretching, C-O stretching and C-O-C stretching which showed the major peaks for alkaloids. The FTIR, which was used to detect the characteristic peak values and their functional groups in tuber extract which may be used to prepare new drugs for the benefit of human health in future.

**Keywords:** *Sauromatum venosum*, tuber extract, secondary metabolites, alkaloids, FTIR

### Introduction

Alkaloids are heterogeneous group compounds which contain one or more nitrogen atoms in acyclic system. These may contain one the functional groups *viz.* carboxylic acid, alcohol, ether, esters amide, amine, alkene, aromatic ring and alkyl or arylhalide. The plants are considered as pharmacologically active contain polyphenolic compound such as alkaloids which exerts a biochemical and /or physiological effect on the cell (Ajibesin, 2005) [1], which could be of benefit to health. Moreover, many alkaloids revealed the significant bioactivities, such as the relieving action of ephedrine for asthma, the analgesic action of morphine, and the anticancer effects of vinblastine (Benyhe, 1994; Huang *et al.*, 2007; Wang, *et al.*, 2009; Lee, 2011; and Lu *et al.*, 2012) [4, 10, 24, 14, 16]. In fact, alkaloids are among the most important active constituents in natural herbs and some of these compounds have already been successfully developed into chemotherapeutic drugs, such as camptothecin (CPT), a famous topoisomerase I (Top I) inhibitor (Haung *et al.*, 2007) [16] and vinblastine, which interacts with tubulin (Li *et al.*, 2007) [15]. Alkaloids are imperative chemical compounds that give a rich reservoir for drug discovery.

*Sauromatum venosum* (Ait.) Schott. syn. *S. guttatum* (Wall.) Schott. (Araceae), is locally known as 'Sanp ki Booti', 'Voodoo lily' or 'Snake Plant.' It is a shade loving perennial herb and found in Melghat region of Amravati District. Tuber/Corm is a condensed form of rhizome consists of solid, stout, fleshy underground stem. It contains heavy deposits of food material. Tuber size is upto 13 cm or more broad, globose and depressed. It is reported to contain the constituents like Lectins, Dimethyl sulphides, p-caryophyllene, indole, ammonia, trimethylamine, primary amines (Shinwari and Khan, 2000) [22]. Plant is reputed to be capable of neutralizing the action of snake venom and their antivenom activity has been related to certain chemical

compounds identified in the plants (Pereira *et al.*, 1994; Jain *et al.*, 2008) [19, 11]. The plant is used as antidote and antitumor (Choudhary *et al.*, 2008) [5].



Fig 1: A) *Sauromatum venosum* Plant B) Tuber/Corm

FT-IR spectroscopy is capable of providing strong insight into the structural and functional alterations induced by various factors due to its high sensitivity, the technique was successfully explored for the study of biological materials. IR spectroscopy has become a widely accepted tool for the characterization of biomolecules present in the sample (Margarita and Quinteiro, 2000) [17]. Fourier Transform Infrared Spectroscopy (FTIR) is the most powerful tool to identify the types of chemical bonds (functional groups) present in the compounds. FTIR spectroscopy is one of the most widely used methods to identify the chemical constituents and elucidate the compound structures to propose in medicinal purposes [Marimuthu and Gurumurthi (2013) [18]; Ashokkumar and Ramaswamy, (2014)] [3]. *Sauromatum venosum* are short lived found in rainy season's remains ethno-medicinally undocumented and have not been explored with respects to phyto-constituents and bioactive constituents. Hence, the present study was planned to investigate the alkaloids in *Sauromatum venosum* corm extract by FTIR Spectroscopy.

## Materials and Methods

**Selection and Collection of Plants:** *Sauromatum venosum* tuber was selected on the basis of its medicinal value and collected from Semadoh region of Melghat of Amravati District in the month of June to September.

**Identification and Authentication of plants:** The plant was further identified with the help of standard floras (Sharma *et al.*, 1996; Almeida, 2001; Dhore, 2002) [21, 2, 6] and authenticated by Dr. S.P. Ro the Professor and Head, Department of Botany, Shri. Shivaji Science College, Akola.

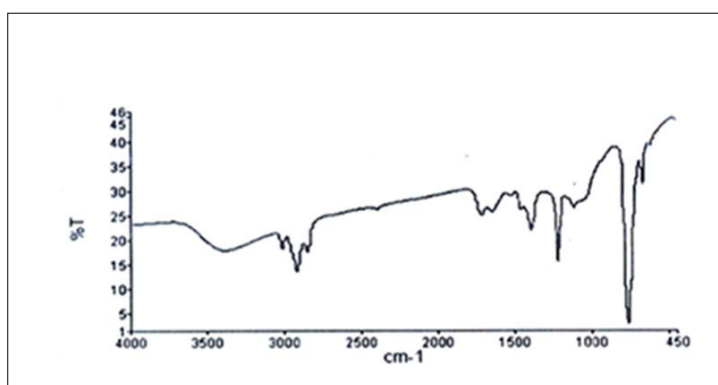
**Preparation of extract:** The *Sauromatum venosum* tuber was cut into fine pieces and kept for shade-dried (at 25°C) and was powdered in the mechanical grinder. The extraction was done by using 20gm of tuber powder in 150ml of solvent by Soxhlet extraction method (Sadasivam and Manickam, 1996) [20] using different solvents such as distilled water, acetone, ethanol, petroleum ether and chloroform. The presence of alkaloids in the sample was detected by performing the qualitative tests (Khandelwal, 2007). The crude quantification of alkaloid was carried out by using precipitation method (Krishnaiah *et al.*, 2009) [13].

**Fourier Transform Infrared Spectrophotometer analysis (FTIR):** The Fourier-Transform Infrared Spectroscopy (FTIR) analysis of the crude extract of *Sauromatum* tuber was carried out from Sophisticated Analytical Instrumentation Facilities, Central Drug Research Institute Lucknow, India. The dried 10gm of powder was mixed with

KBr salt and encapsulated in 100 mg of KBr pellet in order to prepare translucent sample discs. The infrared spectrum of solid was recorded in the scan range from 4000-400  $\text{cm}^{-1}$  on a FTIR spectrophotometer. Samples were introduced in sample chamber and spectra were taken in ATR mode. These spectra were recorded as absorbance values at each data point in replicate two times. Perkin Elmer spectrophotometer was used to detect characteristic peak and their functional group. Results obtained were plotted against wave number verses percent transmission.

## Results and Discussion

The results revealed that the presence of various phytochemicals in crude extract *Sauromatum venosum* tuber. The FTIR spectrum was used to identify and detect the characteristic peaks and functional groups of the active components based on the peak value in the region of infrared radiation (Gupta *et al.*, 1977) [9] (Table 1; Fig. 1). Extract of *Sauromatum venosum* tuber was subjected to FTIR analysis and the functional groups of the components were separated based on their peaks. The results exhibited the presence of characteristic bands at 3019.79  $\text{cm}^{-1}$  indicating the presence of Ar-OH stretching, Strong peak at 2925.88  $\text{cm}^{-1}$  show  $-\text{CH}_3$  stretching, at 2855.32 assign to C-H stretching shows some alkane group present in this rare medicinal plant. Besides Aromatic compounds with Ar-H stretching, at 1215.76 shows C-O stretching indicates presence to ketones, aldehydes, carboxylic acids, and esters bands and sensitive to peptide linkage. Peak at 1113.47 shows C-O-C strong stretching which can from two coordinate compounds (Fig.1).



**Fig 1:** IR Spectra analysis of *Sauromatum venosum* corm for alkaloids

**Table 1:** IR spectral analysis of *Sauromatum venosum* (Ait.) Schott. tuber for alkaloids

Sr. No.	Absorption Observed ( $\text{cm}^{-1}$ )	Assignment	Absorption Expected ( $\text{cm}^{-1}$ )
1.	3019.79	Ar-OH stretching	3500-3000
2.	2925.88	$-\text{CH}_3$ stretching	3000-2800
3.	2855.32	Ar-H stretching	3000-2500
4.	1215.76	C-O stretching	1375-1200
5.	1113.47	C-O-C stretching	1150-1070

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

determined. FT-IR spectroscopy is capable of providing strong insights into the structural and functional alterations induced by the various factors due to its high sensitivity (Toyran *et al.*, 2005; Dogan *et al.*, 2007) [23, 7]. FT-IR technique was used for assessment the type of organic and inorganic complexes in plants. The qualitative phytochemical analysis of aqueous extract of *Sauromatum venosum* tuber detected the presence of carbohydrate and glycosides, protein and amino acids, alkaloids, phenolic compounds & flavonoids, phytosterols, saponins and terpenoids (Ghurde and Malode, 2018) [8]. The present study, the FTIR spectroscopic analysis showed the presences of phytoconstituents in the corm extract. Alkaloids are used as efficacious remedies in low concentrations serves as cardiotonics, potential oncological medicines, etc. Nature offers resources that include chemical compounds which can potentially solve many of

these problems. Investigation of natural products obtained from plants, the isolation of compounds and their modification, and the evaluation of their biological activities, represents an important field of biological and pharmaceutical research.

### Conclusion

The Present study concluded that the *Sauromatum venosum* tuber has rich source of phytoconstituents like alkaloids, flavonoids, saponins, phenols and tannins. FTIR spectra showed the presence characteristic functional group of compound exhibiting the strong peak values C-O stretching indicates presence to ketones, aldehydes, carboxylic acids, and esters bands and sensitive to peptide linkage as well as aromatic and peptide linkage with C-O-C indicate complex compounds used as a cardio tonic with their respective functional groups. Further study is needed with this corm extract to isolate, characterize and elucidate the structure of bioactive compound of this corm extract for industrial drug formulation in future.

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