Academic Sciences International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 4, Suppl 5, 2012

Research Article

ELEMENT AND FUNCTIONAL GROUP ANALYSIS OF *Ichnocarpus frutescens R.Br.* (APOCYNACEAE)

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Received: 31 Aug, 2012, Revised and Accepted: 19 Oct, 2012

ABSTRACT

Medicinal plants are in all way having its own immense importance in current era. Many plants synthesize substances that are useful to the maintenance of health in humans and animals. All plants produce chemical compounds as a part of their normal metabolic activities. These metabolic activities can be measured using HPLC, FTIR, and SEM-EDX etc. The aim of the present study is to identify the functional group and to analyze the trace elements in *Ichnocarpus frutescens.* The quantification of chemical constituents in plant material was carried out by using standard procedures. The findings indicated the presence of amino acids, amides, amines, carboxylic acid, carbonyl compounds, organic hydrocarbons, halogens and the SEM-EDX showed the presence of calcium, magnesium, silicon, chloride, potassium, and carbon in ethanolic extract of *Ichnocarpus frutescens.* However, the current study gives a new, alternative, easy and reliable method for the standardization of the crude extract derived from various medicinal plants.

Keywords: FTIR, SEM-EDX, *Ichnocarpus frutescens*, Functional group.

INTRODUCTION

Medicinal plants are the richest bioresource of drugs for traditional systems of medicine; therefore man has been using plant extracts to protect himself against several diseases and also to improve their health and life-style. The different phytoconstituents present in medicinal plants such as flavonoid, alkaloid, phenol and tannins, carboxylic acids, terpenes, amino acids and inorganic acids. These phytoconstituents present specific distinctiveness and properties to plants[1,2]. Therefore, the analysis of these chemical constituents would help in determining various biological activities of plants[3]. A variety of techniques can be used to determine and estimate the presences of such phytoconstituents in medicinal plants. Chromatography and spectroscopic techniques are the most useful and popular tools used for this purpose.

The Fourier Transform Infrared (FTIR) spectroscopy allows the analysis of a relevant amount of compositional and structural information in plants. Moreover, FTIR spectroscopy is an established time-saving method to characterize and identify functional groups[4]. Mineral elements though usually form a small portion of total combination of most plant materials and of total body weight; it was nevertheless treated as physiologically important particularly in body metabolism[5]. In recent years, scientists and nutritionists have started believing in the therapeutic role of metals in human health[6]. Trace elements play both curative and preventive role in combating diseases. There is a vast scope to exploit the preventive medicinal aspects of various trace elements such as Cu, Cr, etc.

Ichnocarpus Frutescens R.Br. (Apocyanaceae) is an evergreen, laticiferous, wood creeper with rusty red appearance, found throughout India. It is commonly known as black creeper and Palvalli or parvalli[7]. *Ichnocarpus frutescens* is an important plant species traditionally used in Indian system of medicine mainly for the treatment of various diseases such as asthma, bronchitis, cholera, cough dog bites, diabetes, dysentery, fever, jaundice, measles, night blindness, small pox, snake-bites, sore, syphilis, tumor and wound. Hence the interest towards natural sources has become invasively increased by screening the plant for phytochemicals and non-toxicity. The main objective of the study is to identify functional groups and elemental analysis of *Ichnocarpus frutescens.*

MATERIALS AND METHODS

Plant Material

The *Ichnocarpus frutescens* was collected from in and around Coimbatore district. The plant material was identified by Dr. G.V.S. Moorthy, Botanical Survey of India, TNAU Campus, Coimbatore, Tamilnadu and the voucher number is (BSi/SRC/5/23/2001-12/Tech-1326). The aerial part of the plant was washed well with water. They were air dried at 25^{0}C for 25 days in the absence of sunlight and powered well using a mixer. This powdered material was used for the study.

Sample Extraction

100g of dried plant powder was extracted in 500ml of ethanol in an occasional shaker for 24 hrs at room temperature. Repeatedly extraction was done with the same solvent till clear colorless solvent is obtained. Obtained extract was evaporated to dryness by using a rotary vacuum evaporator at 40-50^{o}C and stored at 0-4^{o}C in an air tight container.

Energy Dispersive X-ray Spectroscopy (EDX) Analysis

The plant power sample of *Ichnocarpus frutescens* were subjected to the elemental analysis using Scanning Electron Microscope (SEM) with an energy dispersive x-ray spectrometer (EDX).

FTIR Spectrum Analysis

The ethanol extract of *Ichnocarpus frutescens* was mixed with KBr salt, using a mortar and pestle, and compressed into a thin pellet. Infrared spectra were recorded on a Shimadzu FTIR Spectrometer 8000 series, between 4,000–400 cm^{-1}.

RESULT

SEM-EDX

The results of the elemental composition of *Ichnocarpus frutescens* using SEM - EDX technique was showed in table 1. The SEM EDX spectra of the *Ichnocarpus frutescens* was showed in figure 1. Calcium, Magnesium, Silicon, Chloride, Potassium and Carbon are present in *Ichnocarpus frutescens*. $CaCO_3$, SiO_2, MgO, KCl, K-MAD, Ca-wollastonite are used as the standards. In all these elements, Carbon and oxygen presented as high concentration while K and Ca presented as moderate amount. But Mg, Si and Cl presented only trace quantities.

FTIR Spectral analysis

The IR spectrum of *Ichnocarpus frutescens* was given in fig 2. The C=O stretching frequency at 1689 cm^{-1} shows the presence of unsaturated carbonyl group. The IR stretching frequency at 3385 and 2927 cm^{-1} were due to the hydroxyl and aromatic C-H stretching frequency

respectively. This together with the carbonyl group indicates the presence of a carboxylic acid group. The band at 1612 and 1450 cm^{-1} were due to the >C =C< and CH_2 groups respectively. There was no absorbance in between the region 2220-2260 cm^{-1} indicates that there was no cyanide group in this extract. This results shows that *Ichnocarpus frutescens* does not contain any toxic substances.

Table 1: The percentage of trace elements in the *Ichnocarpus frutescens*

Element	App Conc.	Intensity Corrn.	Weight%	Weight% Sigma	Atomic%
C	38.48	1.0639	48.17	1.88	57.92
O	15.17	0.4737	42.64	1.71	38.49
Mg	0.31	0.7267	0.57	0.13	0.34
Si	0.32	0.9051	0.47	0.11	0.24
Cl	0.42	0.8369	0.67	0.14	0.27
K	3.44	1.0591	4.32	0.27	1.60
Ca	2.28	0.9626	3.16	0.25	1.14
Totals			100.00		

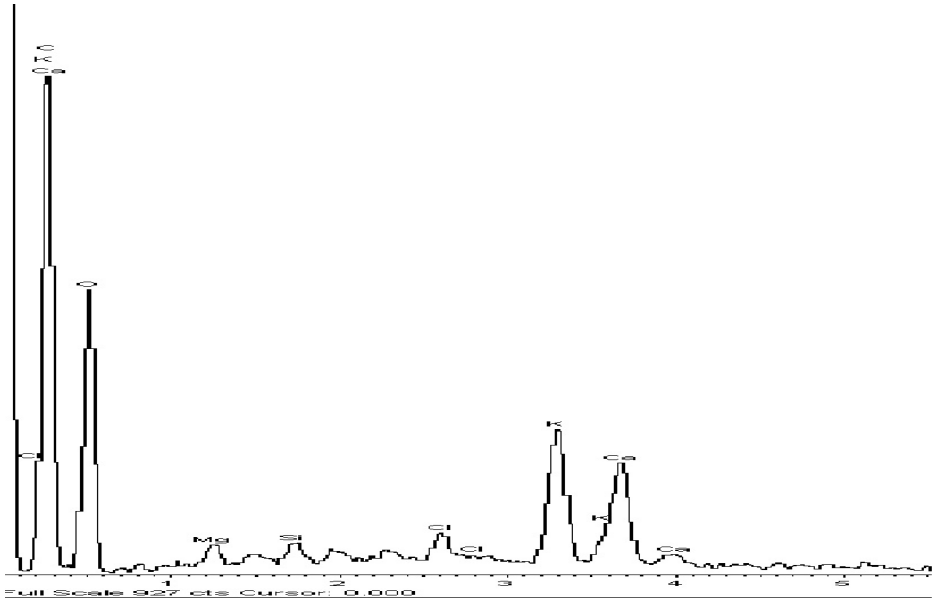

Fig. 1: The SEM EDX spectra of the *Ichnocarpus frutescens*

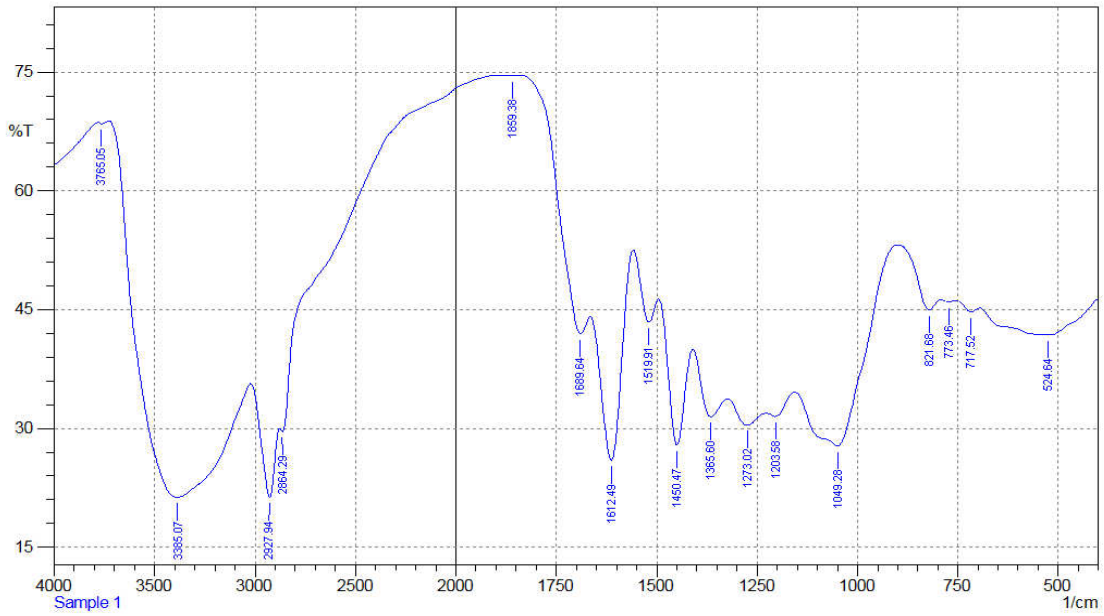

Fig. 2: IR Spectra of *Ichnocarpus frutescens*

DISCUSSION

Generally Medicinal plants are being used in oriental medicine for treatment of ailment ranging from common cold to cancer[8]. Medicinal plants are also known to contain trace element which play vital role as structural and functional components of metalloprotein and enzymes in the living cells. Each mineral plays a number of different functions in the body. The most important pathway of metals to transport into human is from soil to plant and from plant to human. Some metals such as Ca, Mg and Zn have been reported to be essential for human health which does not produce any toxicity to human beings whereas others such as Pb, Cd and Al have been identified as toxic, rests of the elements are not toxic to human[9].

The result showed that the calcium and potassium concentrations are high in our plant material when compared with other elements. Calcium is an essential element in the human body. It is one of the most abundant elements in human body and accounts for 2 to 3 pounds of our total body weight[10]. It is known that potassium is necessary for muscle contraction (especially cardiac fiber), for the synthesis of some proteins and as an enzymic cofactor. Since the minerals are essential part of nucleoproteins metalloproteins, chromoproteins, lipoproteins, etc., the determination of minerals is important in the case of a disease[11].

The bone and teeth development need the calcium and also it regulate heart rhythm, helps in normal blood clotting, maintain proper nerve and muscle functions and lower blood pressure[12]. Magnesium play vital role in a number of physiological and biochemical functions in the human body[13]. Potassium is crucial for heart function and plays a key role in skeletal and smooth muscle contraction a very important phenomenon for normal digestive and muscular function. Potassium is essential for transport of nutrients inside the cell and thus it prevents cell death. Silicon is important element to prevent the hardening of veins and arteries. Chloride works with sodium and potassium to carry an electrical charge in dissolved body fluids and it also helps to regulate the pH in the body. Chloride is important for digestion of food and to absorb many trace elements that what we need to survive[14]. These elements are well established for their pharmacological action in this medicinal plant. Based on the functional group analysis, *Ichnocarpus frutescens* doesn't contain any toxic compounds.

CONCLUSION

The presence of trace elements like Calcium, Magnesium, Silicon, Chloride, Potassium, Carbon and the functional groups like carboxylic acid are responsible for various medicinal properties of *Ichnocarpus frutescens.*

ACKNOWLEDGEMENT

We, the authors are thankful to our Chancellor, Advisor, Vice-Chancellor and Registrar of Karpagam University for providing facilities and encouragement. We are also thankful to Karunya University for SEM -EDAX analysis.

REFERENCES

1. Parekh J and Chanda V. *In vitro* Antimicrobial activity and phytochemical analysis of some Indian medicinal plants. Turk J Biol 2007; 31: 53-58.
2. Saxena M and Saxena J. Evalution of phytoconstituents of *Acorus calamus* by FTIR and UV-VIS spectroscopic analysis. IJPBR 2012; 3: 498-501
3. Ragavendran P, Sophia D, Arulraj C, Starlin T and Gopalakrishnan VK. Evaluation of Enzymatic and Non-Enzymatic antioxidant properties of *Aerva lanata* (L)-An *in vitro* study. Int J Pharm Pharm Sci 2012; 4: 522-526.
4. Grube M, Muter O, Strikauska S, Gavare M and Limane B. Application of FT-IR spectroscopy for control of the medium composition during the biodegradation of nitro aromatic compounds. J Ind Microbiol Biotechnol 2008; 35: 1545-1549.
5. Hameed I, Dastagir G and Hussain F. Nutritional and elemental analyses of some selected medicinal plants of the family Polygonaceae. Pak J Bot 2008; 40: 2493-2502.
6. Udayakumar R and Begum VH. Elemental analysis of Medicinal Plants used in controlling infectious diseases. Hamdard Medicus 2004; 67: 35-36.
7. Kalidass C, Amish Abragam D and Mohan VR. Pharmacognostic Studies On *Ichnocarpus Frutescens* (L.) R.BR. J Herbal Med Toxicol 2009; 3: 23-29.
8. Fisher C. Spices of life. Chemistry in Britain, 2002; 38 : 40-42.
9. Kirmani MZ, Mohiuddin S, Naz F, Iftikhar IN and Zahir E. Determination Of Some Toxic And Essential Trace Metals In Some Medicinal And Edible Plants Of Karachi City J Basic and Appl Sci 2011; 7: 89-95.
10. Bachheti R.K, Indra rai, Joshi A, pandey D.P and sharma. A Physico-chemical and elemental analysis of ash of some medicinal plants from garhwal region, uttarakhand, india by atomic absorption Spectrophotometer (AAS). Int J Pharm Pharm Sci 2012; 4: 359-362.
11. Ekinci N, Ekinci R, Polat R and Budak G. Analysis of trace elements in medicinal plants with energy dispersive X-ray fluorescence. J Radioanal Nucl Chem 2004; 260: 127-131.
12. Bibi S, Dastagir G, Hussain F and Sanaullah P. Elemental composition of *Viola odorata* Linn. Pak J Pl Sci 2006; 12: 141-143.
13. Bahadur A, Chaudhry Z, Jan G, Danish M, Rehman A, Ahmad R, *et al.,*. Nutritional and elemental analyses of some selected fodder species used in traditional medicine. Afr J Pharm Pharmacol 2011; 5: 1157-1161
14. Starlin T, Arul Raj C, Ragavendran P and Gopalakrishnan VK. Phytochemical screening, functional group and elemental analysis of *Tylophora Pauciflora* wight and arn . Int Res J Pharm 2012; 3: 180-183.