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Research Article

Phytochemical Analysis of Bark Extract of *Cinnamomum verum:* A Medicinal Herb Used for the Treatment of Coronary Heart Disease in Malayali Tribes, Pachamalai Hills, Tamil Nadu, India

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ABSTRACT
The present study was carried out to characterize the bioactive constituent present in bark extract of *Cinnamomum verum*using UV-VIS and FTIR analysis. The crude extract of *Cinnamomumverum* was scanned in the wave length ranging from 200-800 nm by using Perkin Elmer spectrophotometer system and the characteristic peaks were detected. FTIR analysis was also performed on a Perkin Elmer spectrophotometer system, which was used to detect the characteristic peak value and their functional groups. UV-Vis profile showed peaks at 286 nm, 206nm and 219 nm with observation of 0.5, 0.7 and 0.6 respectively. FTIR analysis results proved the presence of alcohols, phenols, alkynes, alkanes, aromatic amines, alkyl halides, aliphatic amines and major functional groups observed were cinnamaldehyde and eugenol.

Keywords: *Cinnamomumverum*; FTIR analysis; medicinal plant; pachamalai hills.

INTRODUCTION

India has a rich culture of medicinal herbs, which includes about more than 2000 species and has a vast geographical area with high potential ability for Ayurvedic, Unani, Siddha traditional medicines but only very few have been studied chemically and pharmacologically for their potential medicinal value[1]. The medicinal value of these plants lie in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents would help in determination of phytoconstituents which is largely performed by relatively expensive and often laborious techniques such as gas and liquid chromatography combined with specific detection scheme[2]. There are several reports regarding UV and FTIR studies from the medicinal plants, Phytochemical screening and FTIR spectroscopic analysis of *Phyllanthusamarus, Senna auriculata,Phullanthusmaderaspatnsis* and *Solanum torvum*have shown different characteristic peak values with various functional components which have demonstrated the presence of amide, alcohols, phenols, alkanes, carboxlic acid, aldehydes, ketones, primary amines, aromatics, esther, ethers,alkyl, halides and aliphatic amines compounds[3,4], screened *Solanum torvum* leaves have performed GCMS and FTIR analysis. Analysis of *Stylosanthesfruticosa* bioactive constituents present in leaf extract were studies[5], FTIR studies of the leaves of *Albizialebbeck*ethanolic extract revealed functional components[6]. Evalution of phytoconstituents leaves of *Acorusc alamus* methanolic extract revealed presence of phenolic compound and flavonoids[7,8] carried out the FTIR analysis in the powder samples of leaf, stem, flower to screen bio active components. Cinnamon is a common spice that has been used around the world for many centuries and with lots of uses in cosmetics, food and pharmaceuticals[9]. *Cinnamomum verum* belongs to the family Lauraceae and has been reported to possess significant antiallergic, antiulcerogenic, antipyretic and anaesthetic activities[10]. The bark yields an essential oil containing cinnamaldehyde and eugenol. Several biological activities such as peripheral, vasodilatory, antitumor, antifungal, cytotoxic and cardiovascular disease, antimutagenic, activities has been attributed to cinnamaldehyde[11-14]. The objective of this study was to identify the functional group present in *Cinnamomum verum* by UV-VIS and FTIR spectrophotometer method.

MATERIALS AND METHODS

Study Area

The focus of study area is situated between the two districts of Salem and Tiruchirappalli of Tamil Nadu. The hills lie between 78.31 longitude and 11.28 latitude. The study was undertaken in select areas of Pachamalai Hill, the present survey was carried out between 2013 January and 2015 December, in Pachamalai hills. The interview was desired to identify the indigenous knowledge of plant based remedies from the Malayali community by personal observation. In present study, ethnobotanical survey was

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Figure1: Specimen collected from pachamalai hills, Tamilnadu

documented 13 plant species used for coronary heart disease. The following plants used for the malayali community to treat CHD were identified as *Allium sativum, Piper nigrum, Aervalanata, Centellaasiatica, Millettia pinnata, Boerhavia diffusa, Phyllanthus emblica, Terminsalia bellorica, Terminalia chebula, Nymphaea alpa, Cinnamomum verum, Terminalia arjuna, Citrus lemon.* Among the plants documented *Cinnamomum verum* has been widely used as medicinal plants against several diseases & infection. This justify the study study undertaken using *C.verum.*

Collection and Processing of Plant material

Cinnamomum verum was collected from the Pachamalai hills, Tiruchirappalli district, Tamilnadu, India and authenticated by Dr.JohnBritto, Rapinath herbarium, St. Joseph's College, Tiruchirappalli, and the voucher (1861) and specimens (Figure 1) were deposited in the Department of Botany, Bishop Heber College (Autonomous), Tiruchirappalli for further reference. The bark of the plant samples was washed thoroughly in running tap water to remove soil particles and adhered debris followed by sterile distilled water. The washed plants were blotted on the blotting paper and spread out at room temperature in shade. Shade dried samples were ground to fine powder using tissue blender. The powdered samples were then stored in a refrigerator for further use.

Plant sample extraction

2gm of air dried powder of leaf sample was extracted with 50ml of solvent an ethanol with gentle stirring for 72h. The sample was kept in dark for 72h with intermittent shaking. After incubation,the solution was filtered through Whatmann No.1 filter paper and the filtrate was collected (crude extract). It was then transferred to glass vials and kept at 4° C before use.

UV-VIS and FTIR Spectroscopic analysis

The extract was examined under visible and UV light for proximate analysis. For UV-VIS and FTIR analysis, the extract was centrifuged at 3000rpm for 10min and filtered through Whatmann No.1 filter paper by using high pressure vacuum pump. The sample is diluted to 1:10 with same solvent. The extract was scanned in the wavelength ranging from 200-800 nm using perkin Elmer

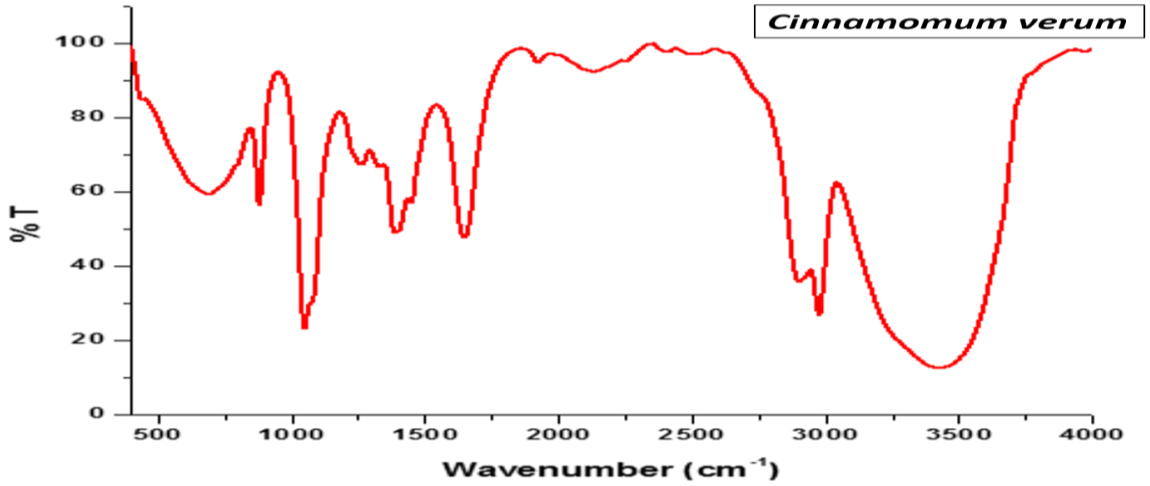

Figure 2: FTIR spectrum analysis of *Cinnamomum verum* bark.

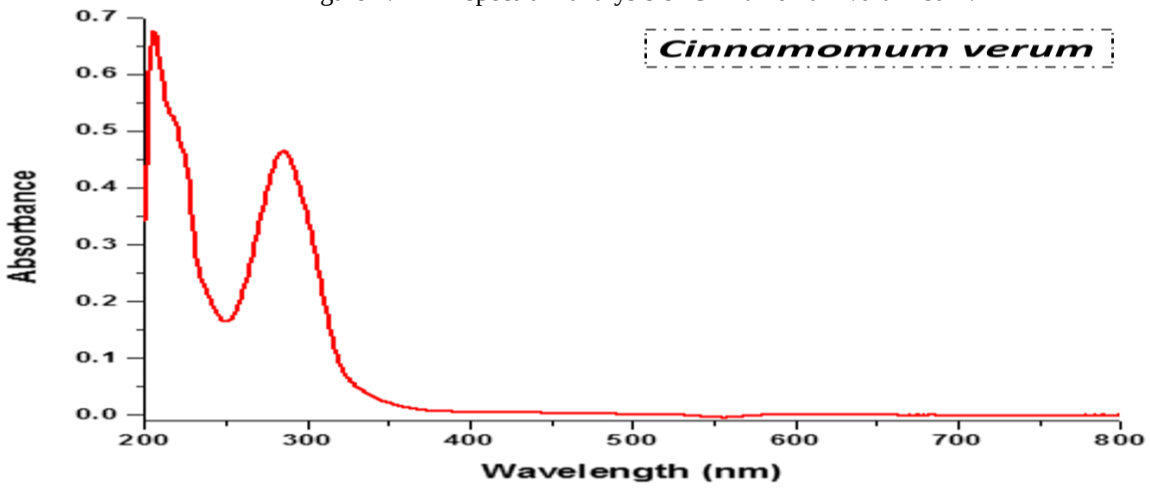

Figure 3: UV_VIS spectrum analysis of *Cinnamomum verum* bark.

Spectrometer and the characteristic peaks were detected. FTIR analysis was performed using Perkin and the characteristic peaks and their functional groups were detected. The peak value of the UV-VIS and FTIR were recorded. All analysis was repeated twice for the spectrum conformation.

RESULTS

Functional group identification

The FTIR spectrum was used to identify the functional groups of the active components present in plant, based on the peaks values in the region of IR radiation. When the plant extract was passed into the FTIR, the functional groups of the components were separated based on its peaks ratio. The absorption spectra of cinnamomum sample bark are shows in figure 2&table 1. The band at 3432.94 was due to O-H stretching of alcohols & phenols. The band at 2411.00 and 2132.85 revealed the presence of -C≡C- stretch alkynes. The peak 1648.74 was attributed to -C=C – stretching of alkenes, the band 1449.96 was C-H bend alkanes, The absorption band1330.70 Aromatic amines. The peak at 1261.60 indicates C-H wag (-CH_2X) of alkyl halides. The band at 1050.03 represent the presence of aliphatic amines.

Quantitative spectrophotometric analysis

The UV-VIS profile of plant extract was taken at 200 to 800nm wavelength due to the sharpness of peaks and proper baseline. The profile showed the peaks at 286.00nm, 206.00nm and 219.00nm with observation of 0.5, 0.7 and 0.6. Figure 3. From the FTIR graph of *Cinnamomum verum* bark sample the O-H stretching ofAlcohols, phenols were noted at 3432.94. The-C≡C- stretch was noted at 2411.00 and 2132.85 alkynes.The C=C – stretch showed peak at 1648.74,The C-H bend attached to the alkanes, demonstrated a peak at 1330.70 C-N stretch of the aromatic amines C-H wag (-CH_2X) in the alkyl halides.The -C≡C-H bendof the aliphatic amines peak value at 1050.03. The above statement is supported by the work of[15].

DISCUSSION

One of the dynamic parts isolated from C.*verum* named 2-methoxycinnamaldehyde (2-MCA) diminishes the expression of vascular cell adhesion molecule 1 (VCAM-1) in TNFα-enacted endothelial cells, recommending that ischemia/reperfusion (I/R) injury is improved because of the induction of hemeoxygenase-(HO-) 1[16]. A later study reported the potential impacts of two compounds, cinnamic aldehyde and cinnamic acid, isolated from C. cassia and C.*verum* against myocardial ischemia[17], demonstrating that cinnamon additionally has the

Table 1: FTIR Peak values and functional groups of *Cinnamomum verum* bark.

S. No	Peak value	Vibration mode range	Vibration mode
1	3975.87	---	-----
2	3432.94	O-H stretch	Alcohols, phenols
3	2977-2903	C-H stretch	Alkanes
4	2505.13	----	-----
5	2411.00	-C≡C- stretch	Alkynes
6	2132.85	-C≡C- stretch	Alkynes
7	1924.39	----	-----
8	1648.74	-C=C - stretch	Alkenes
9	1449.96	C-H bend	Alkanes
10	1388.47	------	------
11	1330.70	C-N stretch	Aromatic amines
12.	1262.60	C-H wag (-CH_2X)	Alkyl halides
13	1050.03	C-N stretch	Aliphatic amines
14	691.44	-C≡C-H bend	alkynes

possibility to be utilized to treat cardiovascular diseases. A few studies have reported the defensive impacts of cinnamaldehyde on the cardiovascular framework. Cinnamophilin is one of the imperative lignans detached from *C. philippinensis*. It has been affirmed to have thromboxane A2 (TXA2) receptor blocking movement in rats and in addition in guinea pigs[18]. Cinnamophilin goes about as a potential thromboxane synthase inhibitor and TXA2 receptor adversary and may be useful when consolidated in the treatment of sicknesses including TXA2 issue[18], for example, platelet total[19] and growths[20]. Cinnamophilin for the most part represses thromboxane receptor-interceded vascular smoothmuscle cell expansion and may have the potential for use in the counteractive action of vascular maladies and atherosclerosis[21]. Cinnamaldehyde produces hypotensive impacts, which are conceivably principally because of fringe vasodilatation in anesthetized pooches and guinea pigs[21]. The vasodilatation actuated by cinnamaldehyde in pooches endured and remained over the recuperation time of the fall in pulse to the standard[22]. A late study demonstrated that cinnamaldehyde extends rodent vascular smooth muscle in an endotheliumindependent way. The capacity of cinnamaldehyde in vasodilatory capacity might be on the grounds that it blocks both Ca2+ deluge and Ca2+ discharge[23]. Cinnamaldehyde deflects the advancement of hypertension in sorts 1 and 2 diabetes by compressing vascular contractility, notwithstanding its insulinotropic impact in insulin lack[24]. In conclusion, the significant functional groups present in *Cinnamomum verum* sample were cinnamaldehyde and eugenol, by observing the position and relative intensities of the band in FTIR. The investigation concluded that the stronger extraction capacity of ethanol could have been produced number of active constituents for many biological activities, which might be utilized for the development of traditional medicine and further investigation needs to elute novel active compounds from the medicinal plants which may be created a new way to treat Coronary Heart Diseases. Further research will be needed to find out the structural analysis of compound by use of analytical method of Gas Chromatography and Mass spectrometer.

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