Available online at
www.ijacskros.com

Indian
Journal of Advances in
Chemical Science

Indian Journal of Advances in Chemical Science 2(4) (2014) 300-302

Ultraviolet-Visible and Fourier Transform Infrared Spectroscopic Studies on Non-Conventional Species of Curcuma

Rajeshwari Sahu*, Jyoti Saxena

Department of Chemistry, Sarojini Naidu Government Girls Postgraduate (Autonomous) College, Bhopal - 462 016, Madhya Pradesh, India.

Received 1th September 2014; Revised 12th September 2014; Accepted 14th September 2014

ABSTRACT

The present study was aimed to produce the ultraviolet-visible (UV-VIS) and Fourier transform infrared (FTIR) spectrum profile of Curcuma caesia rhizome. The extracts were examined under visible and UV light for the proximate analysis. The crude extracts of C. caesia. Rhizome was scanned in the wavelength ranging from 200 nm to 800 nm by using Perkin Elmer spectrophotometer and the characteristic peaks were detected. FTIR method was performed on a Perkin Elmer spectrophotometer system, which was used to detect the characteristic peak values and their functional groups. The UV-VIS profile of C. caesia. rhizome methanolic extract showed the peaks at 256.00 nm, 288.00 nm and 330.00 nm with the absorption 0.617,1.235 and 0.557respectively. The FTIR spectrum was used to identify the functional group of the bioactive components based on different peak values in the region of infrared radiation. The results of the present study confirm the presence of pyrocatachol derivative.

Key words: *Curcuma caesia, Ultraviolet-visible, Fourier transform infrared.*

1. INTRODUCTION

Majority of world's population depends on traditional medicine for primary healthcare. Plants have been extensively used as a rich source of medicine [1,2]. The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids, and phenolic compound [3]. Therefore, the analysis of these bioactive constituents would help in determining various biological activities of plants. The determination of phytoconstituents is largely performed by relatively expensive and often laborious techniques such as gas and liquid chromatography combined with specific detection schemes [4,5]. However, simple, cost-effective and rapid tests for detecting phytocomponents are necessary. Spectroscopic ultraviolet-visible, Fourier transform infrared (UV-Vis, FTIR) methods together or separate can be used in this sense as well as conventional methods [6,7]. The FT-IR has proven to be a valuable tool for characterization and identification of compounds or functional groups (chemical bonds) present in an unknown mixture of plants extract [8,9]. UV-Vis spectrophotometry related to the spectroscopy of photons in the UV-visible region. UV-Vis spectroscopy uses light in the visible ranges or its adjacent ranges. The color of the chemicals involved directly affects the absorption in the visible ranges. Molecules undergo electronic transitions in these ranges of the electromagnetic spectrum [10].

The genus Curcuma, a member of the *Zingiberaceae* family, comprises of 80 species, some of which have been used in traditional systems of medicine (Ayurveda, Siddha, Unani) for a long time [11]. *Curcuma caesia* Roxb. (*Zingiberaceae*), called the black turmeric in English, is a perennial herb found throughout the Himalayan region, North-East and Central India. The rhizomes are used in the treatment of hemorrhoids, leprosy, asthma, cancer, epilepsy, fever, wound, vomiting, menstrual disorder, smooth muscle relaxant activity [12]. In addition to this the Preliminary phytochemical screening of crude methanol extract of *C. caesia* demonstrated strong positive test for phenol, flavonoids and tannin, additionally, alkaloids and saponins were also present [13]. With this knowledge, the present research work was aimed to produce the UV-VIS and FTIR spectrum profile of *C. caesia* rhizome extract.

*Corresponding Author:
E-mail: rajeshwarisahu3@gmail. com

2. COLLECTION AND PREPARATION OF PLANT MATERIAL

2.1. Collection of Plant Material

The rhizomes of Curcuma were collected from Sanjivani Ayurvedic Nursery Bhopal. All the plant materials were further identified in the Department of Botany, SNGGPG College Bhopal, Madhya Pradesh, India.

2.2. Preparation of Extract

The rhizomes were cut into pieces, and air dried at room temperature. The dried rhizomes were coarsely powdered and successfully extracted with methanol using soxhlet extractor at a temperature of 55-60°C for a period of 7-8 hrs [11]. The solvents was distilled off at lower temperature under reduced pressure and concentrated to dryness (crude extract). The dried extract was weighed and then stored in a freezer.

3. UV-VIS AND FTIR SPECTROSCOPIC ANALYSIS

The extracts were examined under visible and UV light for proximate analysis. For UV-VIS and FTIR spectrophotometer analysis, the extracts were centrifuged at 3000 rpm for 10 min and filtered through Whatman No. 1 filter paper. The extracts were scanned in the wavelength ranging from 200 to 800 nm using Perkin Elmer Spectrophotometer and the characteristic peaks were detected. FTIR analysis was performed using Perkin Elmer Spectrophotometer system, which was used to detect the characteristic peaks and their functional groups. The peak values of the UV-VIS and FTIR were recorded. Each and every analysis was repeated twice for the spectrum confirmation.

4. RESULTS AND DISCUSSION

4.1. Quantitative Spectrophotometric Analysis

The UV-VIS profile of plant extract was taken at the 200 to 800 nm wavelength due to the sharpness of the peaks and proper baseline. The profile showed the peaks at 256.00 nm, 288.00 nm and 330.00 nm with the absorption 0.617, 1.235 and 0.557 respectively (Figure 1, and Table 1).

The FTIR spectrum was used to identify the functional group of the active components based on the peak value in the region of infrared radiation. The results of FTIR peak values and functional groups were represented in (Figure 2, and Table 2). When the rhizome extract was passed into the FTIR, the functional groups of the components were separated based on its peaks ratio. The results of FTIR analysis confirmed the presence of phenol, cycloalkane, alkene, aromatic compound.

Hence, the crude extracts subjected to UV-VIS and FTIR analysis is used for the identification of chemical constituents present in *C. caesia* In addition, UV-VIS

Table 1: UV-VIS peak values of extracts of *C. caesia* rhizome.

Wavelength (nm)	Absorption
256.00	0.617
288.00	1.235
330.00	0.557

UV-VIS=Ultraviolet-visible, *C. caesia*=*Curcuma caesia*

Table 2: FTIR peak values of extracts of *C. caesia* plant.

Frequency (cm^{-1})	Inference
3474.78	OH str.
2927.91, 2855.77	CH str.
1636.99	C=C str.
724.57	Out of plan bending of aromatic H

FTIR=Fourier transform infrared, *C. caesia*=*Curcuma caesia*

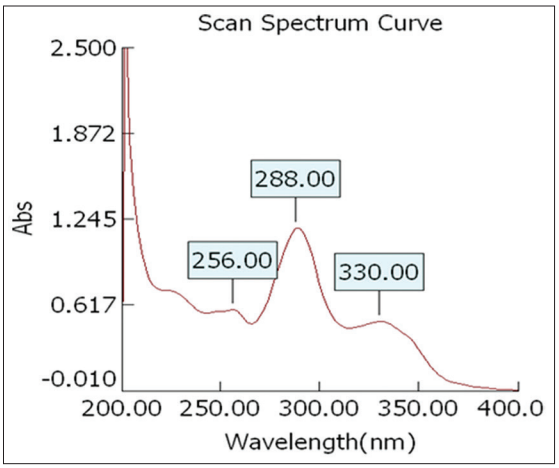

Figure 1: Ultraviolet-visible spectrum of extract of *Curcuma caesia* rhizome.

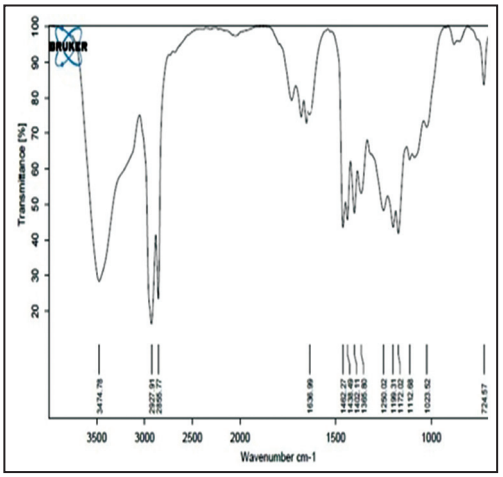

Figure 2: Fourier transform infrared spectrum of extract of *Curcuma caesia* rhizome.

and FTIR spectroscopy is proved to be a reliable and sensitive method for detection of bio molecular composition.

5. CONCLUSION

Spectroscopic methods have become a powerful tool for secondary metabolite profiling as well as for qualitative and quantitative analysis of the pharmaceutical and biological materials. The previous research have showed the main constituents of *C. caesia* are flavonoids and tannin, additionally, alkaloids and saponins were also present [14]. All the earlier reports have focused on the isolation of essential oil from the leave and rhizome. However, the isolation of pyrocatechol derivative from the rhizome of the *C. caesia* is not reported.

Analysis of the methanolic extract of *C. caesia* rhizome under FTIR and UV-VIS spectroscopic technique showed that the presence of phenol which can be isolated and further screened for different kind of biological activities depending their therapeutic uses Further research will be needed for the structure characterization of isolated phenol compound by use of different analytical methods such as NMR and mass spectrophotometer.

6. ACKNOWLEDGMENT

The authors express gratitude Prof. Dr. Jyoti Saxena Department of Chemistry, S.N.G.G.C. College Bhopal, SCAN laboratory Bhopal for FTIR analysis UV-Vis analysis facility and kind support.

7. REFERENCES

1. S. Prabuseenivasan, M. Jaykumar, S. Igancimuthu, (2006) *In vitro* antibacterial activity of some plant essential oils***, BMC Complementary and Alternative Medicine,* 6:** 39.
2. H. Chandarana, A. Baluja, S. Chanda, (2005) Comparison of antibacterial activities of selected species of *Zingiberaceae* family and some synthetic compounds, ***Turkish Journal of Biology,* 29:** 83-87.
3. S. T. Antony, J. M. Paul, J. R. Yesu, (2013) Phytochemical analysis of stylosanthes fruticosa using UV-VIS, FTIR and GC-MS, ***Research Journal of Chemical Sciences,* 3(11):** 14-23.
4. A. Uzer, E. Ercag, R. Apak, (2005) Selective spectrophotometric determination of TNT in soil and water with dicyclohexylamine extraction, ***Analytica Chimica Acta,* 534:** 307-317.
5. N. Eisenhauer, M. Klier, S. Partsch, A.C.W. Sabais A, C. Scherber, W. Weisser, S. Scheu, (2009) No interactive effects of pesticides and plant diversity on soil microbial biomass and respiration, ***Applied Soil Ecology,* 42:** 31-36.
6. K. M. Hazra, R. N. Roy, S. K. Sen, S. Laska, (2007) Isolation of antibacterial pentahydroxy flavones from the seeds of *Mimusops elengi* Linn, ***African Journal of Biotechnology,* 6(12):** 1446-1449.
7. T. L. Eberhardt, X. Li, T. F. Shupe, C. Y. Hse. (2007) Chinese tallow tree (Sapium Sebiferum) utilization: Characterization of extractives and cell-wall, ***Wood and Fiber Science,* 39(2):** 319-324.
8. P. Aysal, A. D. Ambrus, S. J. Lehotay, A. Cannavan, (2007) Validation of an efficient method for the determination of pesticide residues in fruits and vegetables using ethyl acetate for extraction, ***Journal of Environmental Science and Health*, 42:** 481-490.
9. M. Ibrahim, A. J. Hameed, A. Jalbout, (2008) Molecular spectroscopic study of river Nile sediment in the greater Cairo region, ***Applied Spectroscopy,* 62(3):** 306-311.
10. S. Gunasekaran, (2003) UV-VIS spectroscopic analysis of blood serum, ***Asian Journal of Microbiology Biotech and Environmental Science*, 5(4):** 581-582.
11. Y. Dhal, B. Deo, R.K. Sahu, (2012) Comparative antioxidant activity of non-enzymatic and enzymatic extracts of *Curcuma zedoaria*, *Curcuma angustifolia* and *Curcuma caesia*, ***International Journal of Plant, Animal and Environmental Sciences*, 2(4)**: 232-239.
12. I. Karmakar, P. Saha, N. Sarkar, S. Bhattacharya, P.K. Haldar, (2011) Neuropharmacological assessment of *Curcuma caesia* rhizome in experimental animal models, ***Oriental Pharmacy and Experimental Medicine*,** 11: 251-255.
13. S. Das, P. K. Bordoloib, S. R. Singh, D. Phukan, (2012) Study of the anti-ulcerogenic activity of the ethanolic extracts of rhizome of *Curcuma caesia* (EECC) against gastic ulcers in experimental animals, ***Asian Journal of Pharmaceutical and Clinical Research,* 5(2):** 200-203.
14. I. Karmakar, N. Dolai, A. Bala, P. K. Haldar, (2011) Anxiolytic and CNS depressant activities of methanol extract of *Curcuma caesia* rhizome. ***Pharmacology Online* 2:** 738-747.

***Bibliographical Sketch**

Author passed M.Sc chemistry from Barkatuallah University Bhopal and currently pursuing PhD (chemistry) from Barkatuallah University. She have 4 years of teaching experience in chemistry and environment, had published many National and International research paper. For research work she connected to SCAN and CMBT lab Bhopal. Author interested area is Phytoconsistuant of non-conventional species and to compare it with conventional.