PRELIMINARY INVESTIGATION OF THE CAPACITY OF *ZINGIBER OFFICINALE* TO ADSORB LEAD BY FOURIER TRANSFORM INFRA-RED SPECTROSCOPY

P. A. Ekwumemgbo . O. J. Ocholi, K. I. Omoniyi . S. P. Maaji
Chemistry Department,
Ahmadu Bello University, Zaria, Nigeria

INTRODUCTION

- The heavy metal removal by herbal plants has attracted the attention of many workers in the field of the medical and environmental researches due to their medicinal properties, good performance, low-cost and availability.

- *Zingiber officinale* (ginger) is a medicinal plant; it is a sterile, reed-like plant which has a pungent and aromatic rhizome. The generic name *Zingiberi*, is a Greek word meaning ‘root’ (Ghosh, 2011).

- Fourier transform infrared FTIR method is rapid, noninvasive, high-resolution analytical tool, proven to be valuable for characterization and identification of compounds or functional groups (chemical bonds) present in an unknown mixture of plants extract (Ibrahim *et. al.,* 2008).

Aim of the Research

- The aim of this study is to carry out a preliminary investigation by Fourier Transform Infra-red Spectroscopy of the capacity of *Zingiber officinale* to adsorb Lead. Further work is ongoing on the adsorption of lead onto *Zingiber officinale* from biofluid.

Materials and Methods

- Human blood plasma was collected from the Hematology Department of Ahmadu Bello University Teaching Hospital (ABUTH) Zaria.

- The fresh *Zingiber officinale* rhizome was bought from Samaru market, Zaria Kaduna state, repeatedly washed and crushed in an agate mortar, air dried for (5) days and ground in an agate mortar in order to obtain fine powder. The powdered samples were stored in air tight plastic bottles at room temperature for further analysis.

- 1.00 g of the sample was allowed to stand for 24 hours in 50 ppm of the metal ion in human blood plasma and filtered using a whitemann filter paper. The residue was air dried for (8) days and ground in an agate mortar in order to obtain fine powder. The powdered samples were stored in air tight glass bottles at room temperature for further analysis.

- The sample was mixed with KBr and then ground to a homogeneous blend and compressed to give a small transparent disc of 13 mm diameter. . The disc containing the sample was then placed in the infrared spectrometer and the spectrum of the samples were collected





Results and Discussion

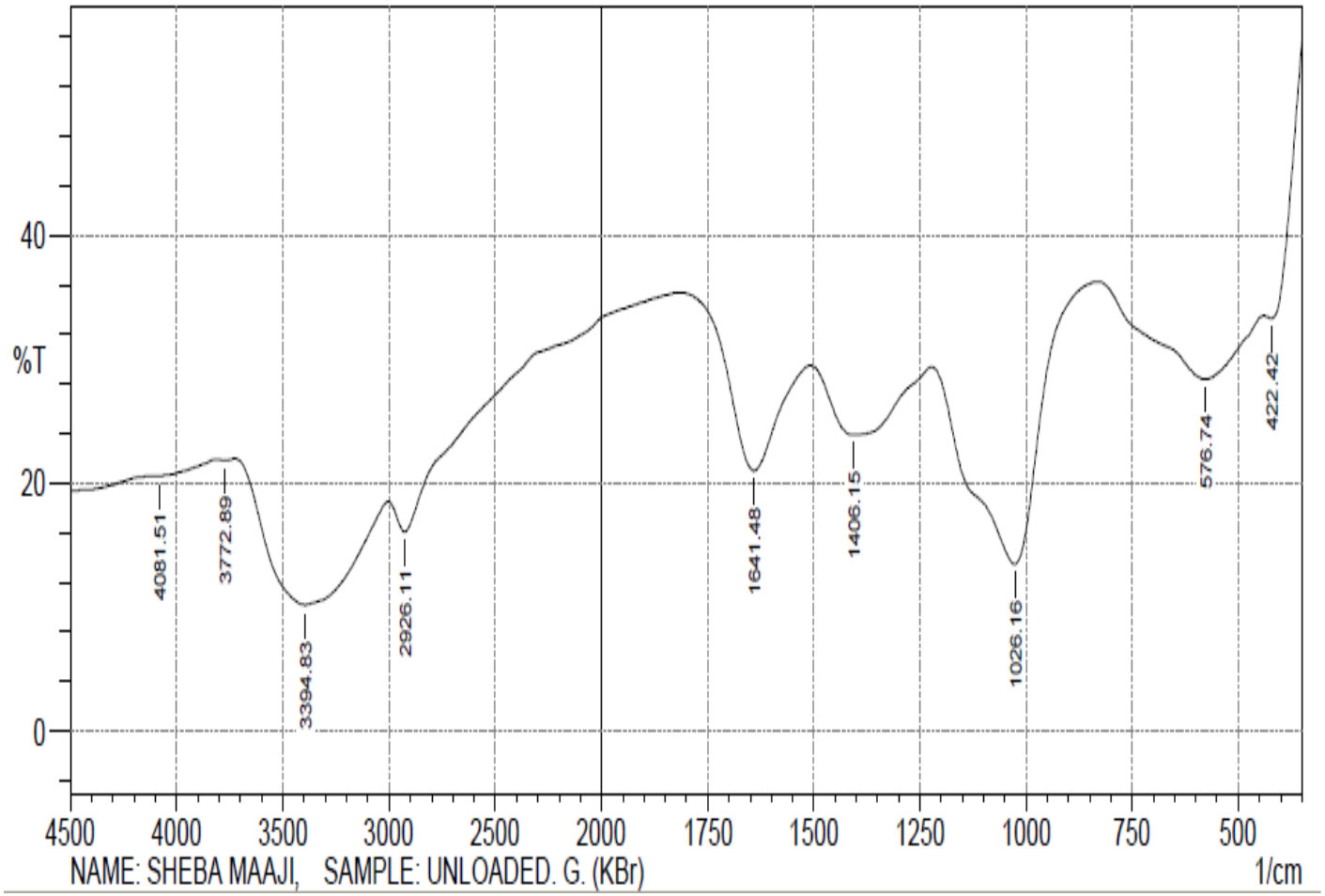


Figure 1: FTIR of fresh *Zingiber officinale* rhizome

Results and Discussion

Table 3.1 FTIR Interpretation for Fresh Ginger (Zingiber officinale) Rhizome				
S/No	Absorption Peak cm-1	Appearance	Bond	Compound
1.	422.42	medium	C – O – C bend	Ethers
2.	576.74	Strong and broad	Ring deformation	Cycloalkanes
3.	1026.16	Very strong and sharp	CH_2 – O - H	Primary alcohols
4	1406.15	Strong and broad	OH bending	Carboxylic acid
5	1641.48	Strong and sharp	C = O stretch	Carboxylic acid
6	2926.11	Strong and sharp	CH_3 and CH_2 stretch	Aliphatic compounds
7	3394.83	Very strong and broad	OH stretch NH stretch	Alcohols and phenols Primary amines, aromatic amines and amides

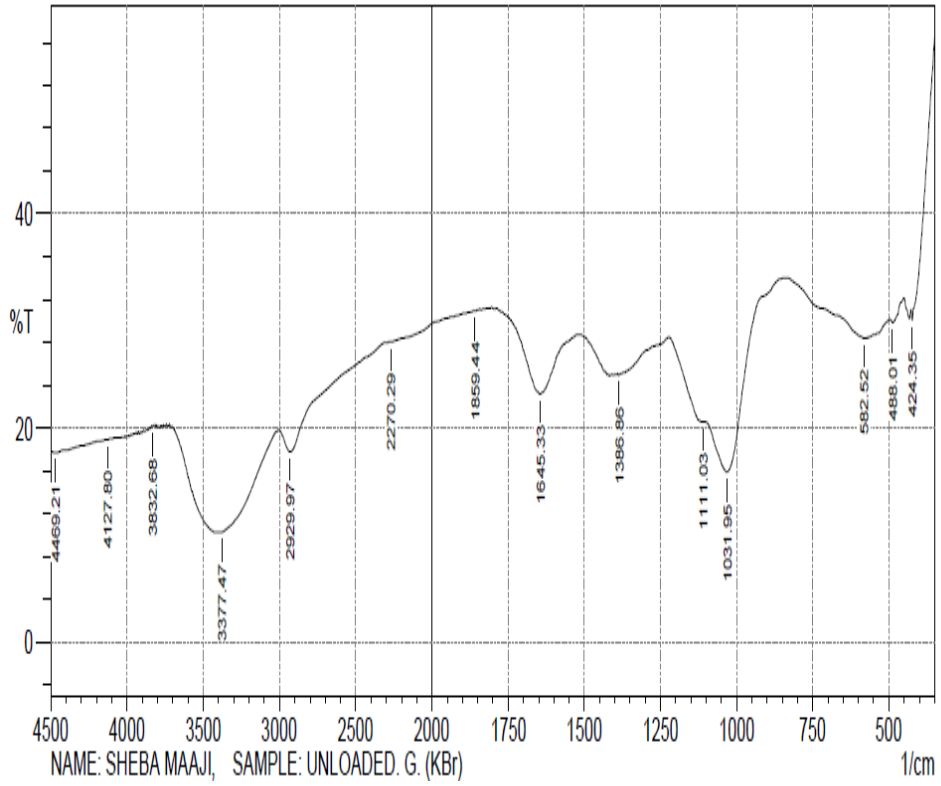


Figure 2: FTIR of Pb loaded fresh *Z. officinale* rhizome

Table 2 FTIR Spectra Interpretation for Pb Loaded Fresh Z. officinale Rhizome

S/No	Absorption peak (cm^{-1})	Appearance	Bond	Compound
1	424.35	Medium	Cl – C = O in plane deformation	Acid chlorides
2.	488.01	Weak	Out of plane ring bending	Naphthalene
3.	1031.95	Strong	CH_2 – O – H	Primary alcohols
4	1111.03	Strong	C – O – H	Secondary or tertiary alcohol
5.	1386.36	Weak and broad	COO^- stretch	Carboxylic acid salt
6	1645.33	Strong	C = O	Carboxylic acid
7	1859.44	Weak	Several bands from overtone and combination band	Substituted benzene ring
8	2270.29	Weak	N ≡ N	Diazonium salts
9	2929.97	Medium	-CH_3 and –CH_2 stretch	Aliphatic compounds
10	3377.47	Strong	OH stretch NH stretch	Alcohols and phenols Primary amines, aromatic amines and amides

Conclusion

- Comparison of the spectra of the fresh sample with the lead loaded sample shows a shift in peak. The presence of carboxylic acid salts, substituted benzene ring, diazonium salts and naphthalene in the lead loaded sample in an indication that lead could bind onto *Zingiber officinale.*

THANK

YOU

FOR

LISTENING