OPEN ACCESS

Scholars International Journal of Chemistry and Material Sciences

Abbreviated Key Title: Sch Int J Chem Mater Sci
ISSN 2616-8669 (Print) |ISSN 2617-6556 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://saudijournals.com

Original Research Article

Determination of Lead (Pb), Iron (Fe), Chromiun (Cr) and the p^H assay in Walnuts Selected Locations of Port-Harcourt, Nigeria

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DOI: 10.36348/sijcms.2021.v04i11.002 | **Received:** 22.10.2021 | **Accepted:** 29.11.2021 | **Published:** 10.12.2021

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Abstract

The analysis of Lead (Pb), Iron (Fe), Chromium(Cr) and P^H in walnuts were carried out in four different locations which includes Rumueme, Eliozu/Air Force, Oil mill and Aba road, the lead, iron and Chromium concentrations were analysed using atomic absorption spectrophotometer. (AAS) while the P^H of the samples were analysed using a ph meter . the results obtained showed wide variations of concentrations of heavy metals present in these different locations as shown in tables 4.1, 4.2,4.3 and 4.4, the level of lead in the four different locations were high compared to the World Health Organisation's recommendation which is about 0.005mg, this was actually attributed to the industrial activities taking place in these areas, and this may result to some health risks like cancer, asthma, hypertention,etc if the walnuts sold in these areas are excessively consumed, however, the P^H result obtained for the four different locations were 6.20,6.50.5..30 and 6.40 respectively, this revealed that the cooked walnuts are quite acidic and may be due to the sources of water and other environmental factors.

Keywords: Walnuts, lead, heavy metals, atomic absorption spectrophotometer etc.

INTRODUCTION

The walnut is an economically very important tree species cultivated throughout the world such as the west indies, japan, china etc. the determination of lead, iron, nickel and p^H in walnuts is also very imperative because of their biological and economical importance of walnut (Akinhanmi *et al*., 2008). African walnut tetracarpidium belong to the family of euphirbiacea and is commonly found in south-east and south-west Nigeria and Cameroon. Walnut (Tetracarpidiumconophorum) is an important crop that is cultivated throughout the world's temperate regions for its edible nuts (Edem *et al*., 2009). It is known in the southern Nigeria as ukpa (Igbo), Western Nigeria as asala (Yoruba). It is known in the littoral and the Western Cameroon as kaso or ngak (Adeleye *et al*., 1991). They are usually planted under an indigenous tree that can provide strong support for the heavy weight of the climber when fully established on the crown of the tree, and in cases where they cannot be harvested manually; they are left for full maturation after which the pod falls off by itself and are picked, removed from the rotten pods, washed and sold in the markets (Hemery, 2006). T.conophorum, like many other plants in Africa and in many other parts of the world has been proven to have decorative, nutritive, medicinal, agricultural and industrial values over the years. Conophor are cultivated principally for the nuts which are usually cooked and consumed as snacks (Enujiugha and Ayodele, 2003). Tetracapridiumconophorum contained in a pod which may house; one shelled nut(single), two shelled (double) and three shelled nut(triple). The walnut shells could be black or brown from the plant. The nut is witish upon cracking form the shell. The nut has a thin layer between two halves (when a nut is divided into two equal parts) of nut. The seed (subglobose) is about 2.5cm long and has wooly materials that attach the nut to the shell when cracked open. A bitter taste is usually observed upon drinking water immediately after eating nuts. This could be attributed to the presence of chemical substances such as alkaloids (Ayodele 2003). Walnut shells is a waste generated in the walnut (Tetracarpidiumconophorum) harvest, containing natural compounds with antioxidants properties. The walnut shell has antioxidant compounds such as flavonoids which have been determined (Akbari *et al*., 2012). Tetracarpidiumconophorum can be cooked, roasted or sun dried and toasted seeds could be ground like melon seeds and thickener in soup preparation. The plant is known in Africa especially in the Eastern and

Western parts of Nigeria for its antibacterial efficacy (Copur *et al*., 2007). Decoction of leaves and seeds serve as beverage which relieves abdominal pains and fever (Malu *et al*., 2009). Dried walnut can be ground and turned into flour which can be used as composite flour during baking or in-place of milk in tea preparation (Stevens and Domelan, 2003). The determination of lead, iron, and p^H in walnuts became very imperative because it is significantly consumed and as food (Ajaiyeoba and Fadare, 2006).

MATERIALS AND METHOD

The materials used include pH meter, ethanol, (BDH England) AAS, acetone (BDH England), glasswares like beaker, conical flask, flat bottom flask etc, distlled water.

The walnuts were collected from four different locations which includes rumueme, eliozu/air force, oil mill and Aba road.

Procedure for the determination of heavy metals in walnut

Digestion procedure for metal analysis of the walnuts

- Dry sample in room temperature for seven days or dry in an oven at temperature of 105^o
- Grind sample to homogenize lumps
- Sieve sample using 2mm sieve or 250 m mesh to bring sample to the same size
- Take a quantity of sample and weigh in balance (5.0g)
- Add 2ml conc HNO_3 and 6ml conc of HCl a small quantity of water or 10ml HNO_3 /H_2O_2 mixture v/v (3:1) and 4ml of H_2O
- Heat the mixture/ solution in a fume cupboard until brownish foam stops.
- Make the funnel using filter paper and insert over 100ml measuring cylinder
- Transfer the digested content into the filter paper and make up the volume either 20ml or 5ml and not more
- Take the filtrate to the AAS and run the metal of interest.

RESULT AND DISCUSSION

4.1 Fe, Cr and Pb test for specimen A (Rumueme)

PARAMETER	Method	Result
Pb	AAS	5.38mg
Fe	AAS	0.168mg
Cr	AAS	0.132mg

4.2 Fe, Cr and Pb test for specimen B (Eliozu/Air Force)

PARAMETER	Method	Result
Pb	AAS	6.38mg
Fe	AAS	1.168mg
Cr	AAS	1.33mg

4.3 Fe, Cr and Pb test for specimen C (oil-mill)

PARAMETER	Method	Result
Pb	AAS	4.38mg
Fe	AAS	1.138mg
Cr	AAS	1.56mg

4.4 Fe, Cr and Pb test for specimen D (Aba Road)

PARAMETER	Method	Result
Pb	AAS	6.30mg
Fe	AAS	1.160mg
Cr	AAS	1.06mg

4.5 Result of the analysis of P^H samples

Specimen	Result
Specimen A P^H	6.20
Specimen B P^H	6.50
Specimen C P^H	5.30
Uncooked P^H	6.40

DISCUSSION

From the results obtained in analysing the concentration or level of lead, iron, chromium and P^H of walnuts collected from the four different locations in Port Harcourt wwhich are Rumueme axis, Eliozu/Air Force, oil-mill and Aba road respectively. The results show that the concentration of lead (Pb) is very high in the different locations which may be attributed to industrial activities of both mining and non-mining activities, the presence of gas flaring, carbonmonoxide and non-oil activities can be sources of lead poisoning which are highly concentrated in these areas, however, the concentration of iron (Fe) is low when compared to that of lead in these areas.Consequently, excessive consumption of walnuts sold in these areas may have some health implications like diarrhoea, low sperm count or infertility, cancer, loss of appetite, etc. Moreover, the concentration of lead in these areas are higher to the World Health Organization reference standard for lead which is 0.005mg. The P^H of the cooked walnuts were also analysed but revealed that the P^H of the cooked walnuts were highly acidic and may be attributed to same industrial activities.

CONCLUSION

From the assay conducted and the results obtained, it is obviously shown that the concentration of lead(Pb) in Rumuokoro axis, Rumuokwuta-Choba, Aba road and mile 3 and Borokiri axis is high and this is likely attributed to both mining and non-mining industrial activities which are easily absorbed or exposed to the walnuts that are public sold or consumed in these areas, it has also shown that the acceptable limits of lead concentration in nuts by WHO is lower than the analysed, however, this may have some health implication due to lead poisoning. The P^H analysis also showed that the walnuts are generally acidic.

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