Mineral Composition of Edible Clays from the Ozanagogo, Delta State, Nigeria

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Abstract
Edible clays from Ozonagogo were analysed for mineral composition these study is aimed at identifying, the mineral nutrient present in edible clay for consumption. Sample of clays were obtained from Ozonogo, Dleta State, grounded and sieve through 5mm stainless sieved, dried, baked into spherical units. The samples were then tested for various mineral compositions, according to standard method recommended by Association of Official Analytical Chemist (AOAC). The results showed that iron is the most predominant mineral with content ratio of (418 ± 0.02 – 623 ± 0.10 mg/100g), sodium (2.00 ± 0.00 – 3.70 ± 0.01 mg/100g), Potassium (20.65 ± 0.01 – 43.01 ± 0.02), calcium (2.7 ± 0.02 – 5.30 ± 0.02 mg/100g) Magnesium (40.00 ± 63.05 mg/100g), phosphorus (3.00 ± 0.00 – 3.37 – 0.02 mg/100), copper (1.10 ± 0.15 – 1.87 ± 10mg/100g) Zinc 2.01 – 21.74 mg/100) were found in significant concentration in the edible clays. They are potential source of nutrients.

Keywords: *Edible clays, minerals; composition, blood pressure; nutrients.*

Introduction

Edible clays existed mostly in rural areas or pre-industrial areas, existing by children and pregnant women. The eating of clay popularly known as Geophagia is a deliberate or conscious intake of earth or soil through the mouth into our body (Alexander et al., 2002). Geophagia occurs in any age group, sex, race, time or at any geographical region of the world. Most times it is associated with pregnancy or as a treatment for disease (Geophagia, 2013). Many clay eaters are imitators of those around them or relatives or cultural practice. Pregnant women eat clays or other substances like bitter kola which help or prevent vomiting, cured swollen legs, to adsorb poisons eaten by the mothers, to give birth to children with smooth skin (Verneer et al., Mcloughlia, 2010).

In some parts of Africa, rural areas of the united state and some villages of India, clay consumption is related with pregnancy. In south Africa younger women believe that earth eating will give them a lighter colour (making them supposedly more attractive) and make their skin soft (Dominy et al., 2010). In Nigeria, edible clays are called calabash chalk –in local language as Eko, Nzu, Poto, Ebumba Uto are among the names used in Nigeria. (Alexander et al, 2002). Most of these edible clays are rich materials. These clays rich materials are dried and baked into blocky or spherical unit. Clays contain large amount of trace minerals (US patent) various risks are associated with clay that are contaminated by human or animal e.g egg of parasites like worms, injection of bacteria and intestinal obstruction (Bisi-Johnson et al., 2010). Clay serves as reservoir of chemical and biological agent apart from mineral elements in air and water. Such agents are radioactive gases, organic chemical and trace metals as well as selenium in clays. Minerals such as iron, copper, zinc,

manganese, sodium, potassium and phosphorus concentration most times is higher because of contamination (Victor 2013) and manganese is essential and play important minerals can produce toxic effect at high concentration (Nurnadi, 2013). These edible clays were obtained from subsurface areas in Ozanagogo community in Agbor where they are sold to traders who retail them. Ingested geophagical material as edible clays (Eko Nzu or Ulor has the potential to release mineral nutrients when they come in contact with digestive fluid. Edible clays sold in Agbor may contain nutritive essential elements and non-toxic (Clay mineral research, 2013). These are insufficient data on the edible clay quality sold in Agbor market. This study was undertaken to ascertain the nutritive value and health benefits of essential minerals in edible clays sold in Agbor marker.

Materials and Mehtods

The various clays known as Eko and Nzu among the Urhobo and Ika tribes in Delta State Nigeria were purchased from three different markets, Abavo, Garage and Obi market in Agbor Delta State. It is located in Northern part of the Niger Delta South Central of Nigeria. It lies within the coordinates of latitudes 06^{o} 05′N and longitudes 06^{o} 07′E and 06 12′ E. The principal relied features of the area are undulating rugged sedimentary terrain characterized by mainly sand and minor clay with steep slope toward Orogodo River. Samples of each clay type were purchased and used in triplicates. They were purchased between March 10^{th} and August, 2016.

Sample preparation

Two varieties of clay were grind using mortar and pestle porcelain and air dried in the laboratory. It was sieved though a 5 mm stainless sieve. The air dried samples were store in polyethene bags and properly labeled. Mineral composition of the samples were determined according to methods recommended association of Official Analytical Chemists (AOAC, 1990) modified by DRAR-ECN, 2013)1 g of air-dried sample was weighed into a cleaned 200 ml glass beaker and digested with aqua regia (freshly prepared HNo3 and HCL in ratio 1:3) and heated in a water bath for complete dissolution of solids. It was left to cool and 20 ml of deionised water added to dilute it. It was previously washed with 1% nitric or trioxoniate (v) acid. Copper, iron and zinc were analysed by Atomic Absorption Sepctrophometer (Pye-Unicam 969, Cambridge UK) and Bulk scientific VGP 210 model. Phosphorous content was determined colourimetrically suing phosphor-vanadomolybdate method; calcium and magnesium were qualified complex metrically using EDTA method or titration, while flame photometer (Corning 400, UK) was used for sodium and potassium analysis.

Result

Calcium an important mineral required for bone formation and nuerolgical function. Mineral are important component of diet take into cognizance of their various physiological metabolic functions in the body. The calcium content was low in all the samples considering the WHO/FAO recommended intake of 400 – 500 mg per day of calcium for adult and 1200 mg per day for children metabolism in bones and also involves children. However calcium was higher in that from Baleke and was significantly different ($P < 0.05$).

Table 1: Mean concentration of sodium, potassium, calcium and phosphorus in edible clays Ononogogo (mg/100g)

Minerals	Type	Obi	Baleke	Garrage
Sodium	Type 1: Nzu	2.20 ± 0.03	3.70 ± 0.01	2.2±0.02
	Type 2: Ulo	2.30±0.04	2.00±0.00	2.00±0.00
Potassium	Type 1	21.04±0.04	43.01±0.02[b]	21.02±0.04
	Type 2	21.00±0.00	41.03±0.01	20.05±0.01
Calcium	Type 1	2.80±0.02[b]	5.30±0.2a	2.80±0.02
	Type 2:	3.02± 0.01	5.00±0.01	2.90±0.01
Magnesium	Type 1	38.46 ±0.02	60.0±0.01	61.00±0.01
	Type 2	40.01±0.01	63.00±0.01	63.01±0.01
Phosphorus	Type 1	3.37±0.02	3.34±0.04	3.20±0.01
	Type 2	3.00±0.00	3.01±0.01	3.00±0.00
Na/K	Type 1	0.1	0.1	0.1
	Type 2	0.1	0.1	0.1
Ca/P	Type 1	1.0	1.0	1.0
	Type 2	1.0	1.0	1.0

*Mean –Stand Deviation of three replicates
*values with different superscript are significant different ($P < 0.05$).

Magnesium is the second most abundant in three samples and that of Garage was highest for Type 2 (Ulo) 63.01 ± 0.01. Magnesium plays essential role in calcium metabolism in bones and also involve in prevention of calculator disease/ considering the adult required daily allowed (RDA) of 250 mg/day (FNB/IOM, 2002). Considering the adult required daily allowed (RDA) of 350 mg/day, it cannot be regarded as a rich source of magnesium to the body.

Table 2: Mean concentration of iron, copper, zinc, (mg/100g) Na/K and Ca/P of edible days form Ozangogo

Minerals	Type	Obi	Baleke	Garrage
Iron	Type 1: Nzu	428.00±0.01b	623.40±0.10a	430.00±0.11
	Type 2: Ulo	418.00±0.02b	02.30±0.70a	428.01±0.02
Copper	Type 1	1.21±0.16b	1.87±0.10	1.20±0.01
	Type 2	1.10±0.15	1.85±0.11	1.17±0.01
Zinc	Type 1	2.40±0.06a	11.35±0.13b	21.03±0.05
	Type 2:	2.01±0.04	11.30±0.11.0.11	21.74±0.01

Na/K = Sodium to potassium ratio
Ca/P = Calcium to phosphorus ratio

Zinc is an essential micronutrient associated with number of enzymes, especially those associated with synthesis of ribonucleic acid (Omole, 2003). Zinc deficiency limits the rate of recovery for protein energy in children furthermore magnesium in association with Zinc constitutes prosthetic groups of enzymes in body metabolism and their deficiency in ratio can lead to growth retardation Comule, 2003. Zinc from Obi markets has concentration of 22.40 ± 0.06 mg/100g) Zinc, which is greater than 11.30 ± 0.11. The results indicate that the samples could supplement Zinc requirement in the body supplement Zinc requirement in the

body consideration the RDA of 22 – 25.00 mg/100 for adult male. The copper values from the different samples range from the different samples ranges between (1.10 – 1.87 mg/100g) in agreement with some finding Ilori, 2011).

Na/K ratio in the body helps in controlling high blood pressure (Yusuf, 2007). The result obtained in this study showed that Na/K ratio is in agreement with the recommended value. The result of Ca/P ratio in the edible clay form Baleke sample shows it is rich in calcium loss of calcium in urine and increases calcium level in bone. The value from Baleke is considered good as a good food source (Yusuf 2007). Since food source ranked good if its Ca/P ratio is above 1 and poor when the ratio is less than (005 m/100g) results portrayed that both (all samples of edible clays are good source of calcium and phosphorus.

Conclusion

The results of the analysis shows that edible clays especially that from Baleke could be in potential source of iron, magnesium and a good source of food for lowering blood pressure.

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