HEAVY METAL LEVELS IN FLUTED PUMPKIN LEAVES (*Telfairia occidentalis*) OBTAINED FROM TAI EXPRESS WAY (TAI LGA) AND BORI MARKET (KHANA LGA) IN OGONI LAND, RIVERS STATE, NIGERIA.

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ABSTRACT: The concentrations of heavy metals (Cd, Cr, Cu, Pb and Hg) were determined in pumpkin from Tai Express road and Bori market. Samples were collected, prepared, digested and analyzed using AAS. The levels of heavy metals obtained for pumpkin samples from Tai Expressway are Cr (2.83 mg/kg), Pb (2.27 mg/kg) Cd (1.06 mg/kg), Cu(17.74mg/kg) and Hg (>0.001 mg/kg) while the levels of heavy metals obtained for pumpkin leaves from Bori market are Cu (2.95 mg/kg) , Cr (0.76 mg/kg), Cd(< 0.01), Pb (< 0.01) and Hg (< 0.01) . The concentrations of heavy metals detected in the pumpkin leaves bought from Tai express roadside in Ogoniland Rivers State showed increase in the order of Cr (2.83mg/kg) >Pb (2.27 mg/kg) >Cd (1.06 mg/kg) when compared with FAO/WHO permissible limit, except Cu(17.74mg/kg) and Hg (>0.001 mg/kg) that were below FAO/WHO recommended values. While the pumpkin leaves bought from Bori market contains levels of Cu (2.95 mg/kg), Cr (0.76 mg/kg), Cd(< 0.01), Pb (< 0.01) and Hg (< 0.01) below the WHO/FAO permissible limits.

KEYWORDS: PUMPKIN, TAI, BORI, HEAVY METALS, Ogoni

1. INTRODUCTION

Ogoni is located in Rivers State, east of the city of Port Harcourt. It extends across the Local Government Areas (LGAs) Khana, Gokhana, Eleme and Tai. Traditionally, Ogoniland is divided into the six kingdoms of Babbe, Gokana, Ken-Khana, Nyo-Khana, Eleme and Tai.

In a 2011 assessment in Ogoniland by the United Nations Environment Programme (UNEP), they found that impacts of the 50 years of oil production in the region extended deeper than previously thought. Because of oil spills, oil flaring, and waste discharge, the alluvial soil of the Niger Delta is no longer viable for agriculture.

In 2012, the Nigerian Minister of Petroleum Resources, Deizani Alison-Madueke, announced the establishment of the Hydrocarbon Pollution Restoration Project, which intends to follow the UNEP report suggestions of Ogoni land to prevent further degradation. (UNEP News Center, 2012*).* Ogoni land has been completely destroyed by the search for oil, oil blowouts and spillages. Oil companies have flared gas in Nigeria for the past thirty three years causing acid rain. What used to be the bread basket of the delta has now become totally infertile. Environmental degradation has been a lethal weapon in the war against the indigenous Ogoni people (Nixon, 1996)

Pollution is one of the most important problems around the world in which thousands of millions of world inhabitants suffer health problem related to industry and atmospheric pollutants (Martinez *et al*., 2001). Trace metals enter into

our environment from both natural and anthropogenic sources (Pendias- Kataba and Pendias, 1986). They contaminate food source and accumulate in both agricultural products and seafood through water, air and soil pollution (Lin *et al*., 2004). All trace metals are toxic at soil concentration above normal level. Addition of trace element to soil may affect microbial proliferation and enzymatic activities, possibly leading to a decrease in the rates of the biochemical process in the soil environment. The effect of trace metals on biochemical reaction in soils may vary with pH, organic matter content, particle size distribution, vegetation and total hydrocarbon content (Esser *et al*., 1991; Sims and Kline, 1991). Heavy metals have been variously defined as those metals with higher atomic number and weight (Norman, 1981).

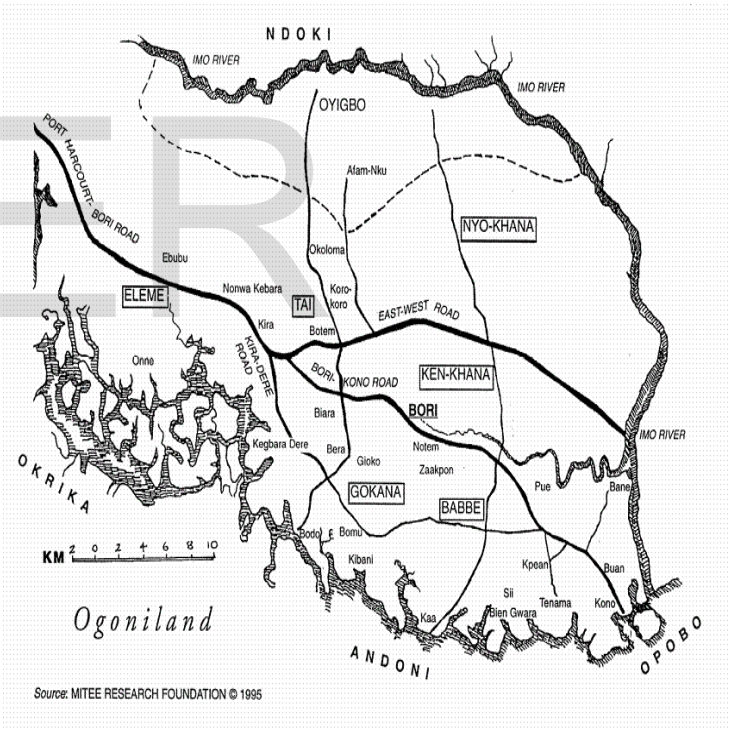
Fluted pumpkin is a tropical vine plants. Its origin can be traced to the family of *Curcubitaceae* with a botanical name known as *Telfaira occidenta*lis. Vegetables are important ingredient of human diet that contains essential nutrients and trace elements. Some of these vegetables are used in making our traditional soups or served as intergral parts of the main course of a meal. Leafy vegetables occupy a very important place in the human diet, but unfortunately are sources of heavy metal accumulation (Abdulla and Chielnicka, 1990). Studies carried out by Al-Jassir et al. (2005) revealed that leafy vegetables accumulate higher metals concentration than others.

2 MATERIALS AND METHODS

2.1 Study Area

Ogoni is located in Rivers State, east of the city of Port Harcourt. It extends across the Local Government Areas (LGAs) Khana, Gokhana, Eleme and Tai. Traditionally, Ogoniland is divided into the six kingdoms of Babbe, Gokana, Ken-Khana, Nyo-Khana, Eleme and Tai.

Ogoni Kingdom (also known as the Ogonis) is one of the many indigenous peoples in the region of southeast Nigeria. They number about 1.5 million people and live in a 404-square-mile (1,050 km^2) homeland which they also refer to as Ogoni, or Ogoniland. Ogoni land has been completely destroyed by the search for oil, Oil blowouts, spillages, oil slicks, and general pollution accompany the search for oil.



2.2 Collection of Sample

Pumpkin leaves (*Telfairia occidentalis*) were purchased from two different markets (Tai express way and Bori). These are popular markets which supply lots of markets in the state with pumpkin leaves. The sample were transported to the laboratory for digestion and analysis using AAS.

2.3 Sample Preparation

All the collected samples of pumpkin leaves were washed with deionised water to remove airborne pollutants. The leaves were removed from the stem weighed and air-dried for a day, to reduce water content. The dried leaves were ashed in a furnace of 500^0C. The ashed samples were allowed to cool and then stored in air-tight plastic containers.

2.4 Digestion of the Samples

10 grams of the ash was digested with 10 mls of HNO_3 and gently heated on a hot plate. Heating was then continued until the brown fumes turned to white. The beaker was brought down to cool to room temperature. The mixture was rinsed with 20mls of deionized water and filtered into a standard 25mls volumetric flask using whatman filter paper. The presence of lead, cadmium, chromium, copper and mercury were analysed in samples using Atomic Absorption Spectrophotometer (AAS).

3 RESULTS

The results for the various levels of metal concentrations (mg/kg) for fluted pumpkin (*Telfairia occidentalis*) is presented in Table 1 and figure 1. Table 1 indicates Cd, Cr, Cu, Pb and Hg concentrations of the pumpkin leaves bought from Tai express roadside and Bori market in Ogoniland Rivers State .

The observed concentrations of Cd, Cr, Cu, Pb and Hg in pumpkin (*Telfairia occidentalis*) leaves were compared with the recommended limits established by the WHO /FAO in figure 1 to ensure the safety and well being of the consumers.

Table 1: Mean Concentration of heavy metals (mg/kg) in pumpkin leaves (*Telfairia occidentalis*) from Tai expressway and Bori Rivers State.

SAMPLE AREA	**HEAVY METALS (Mg/Kg)**				
	Cd	**Cr**	**Cu**	**Pb**	**Hg**
TAI EXPRESS ROAD	1.06	2.83	17.74	2.27	< 0.001
BORI MARKET	< 0.001	0.76	2.95	< 0.001	< 0.001
FAO SAFE LIMITS mg/kg (2005)	0.01	0.08	0.20	0.01	-
WHO SAFE LIMITS mg/kg (2005)	0.10	0.85	0.02	0.01	-
WHO/FAO SAFE LIMITS mg/kg	0.2	2.3	40	0.3	-

According to Table 1, the concentrations of heavy metals detected in the pumpkin leaves bought from Tai express roadside in Ogoniland Rivers State showed increase above WHO/FAO SAFE LIMIT in the order of Cr

(2.83 mg/kg) >Pb (2.27 mg/kg) >Cd (1.06 mg/kg) except Cu(17.74mg/kg) and Hg (>0.001 mg/kg) that were below WHO/FAO SAFE LIMIT . The result also showed that the levels of Cu (2.95 mg/kg), Cr (0.76 mg/kg), Pb (< 0.001 mg/kg) and Cd (< 0.001 mg/kg) of pumpkin leaves bought from Bori market were below the WHO/FAO safety limits.

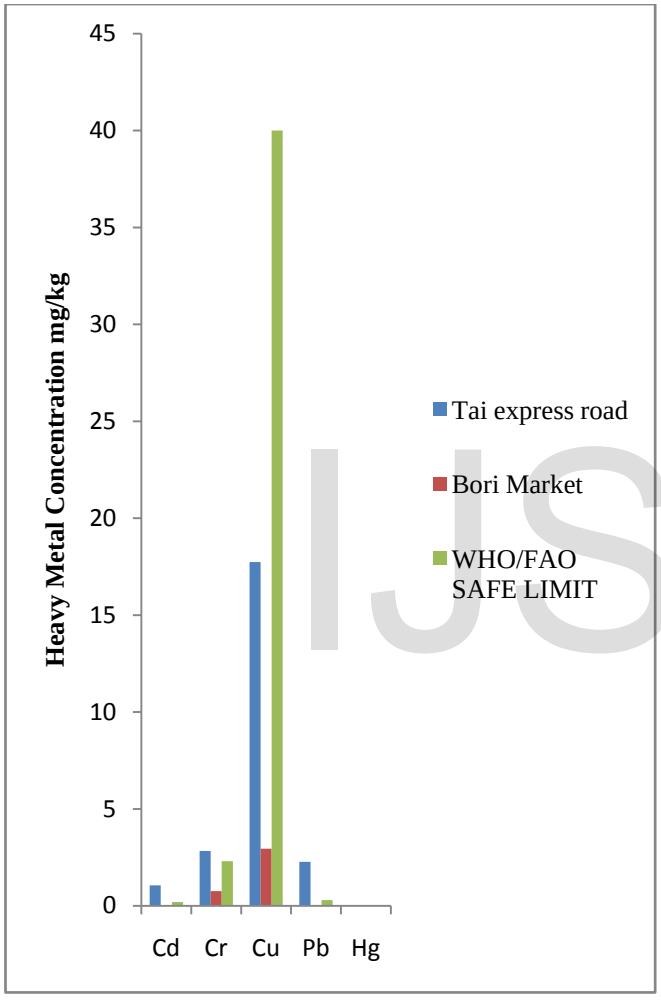


FIGURE 1: HEAVY METAL CONCENTRATION (mg/kg) OF PUMPKIN LEAVES IN TAI EXPRESS ROAD AND BORI MARKET

4 DISCUSSION

The concentration of heavy metal detected in the pumpkin leaves bought from Tai express roadside in Ogoniland Rivers State showed increase in the order of Cr (2.83 mg/kg) >Pb (2.27 mg/kg) >Cd (1.06 mg/kg) when compared with WHO / FAO permissible limit, except Cu(17.74mg/kg) and Hg (>0.001 mg/kg) that were below WHO / FAO permissible limit. While the pumpkin leaves bought from Bori market contains levels of Cu (2.95 mg/kg) ,Cr (0.76 mg/kg), Cd(< 0.01), Pb (< 0.01) and Hg (< 0.01) below the WHO / FAO permissible limit.

The rapid industrialization and urbanization in Tai express road and increment of traffic activities may contributes to the high concentration of heavy metals in pumpkin leaves from Tai express road. Cu, Cd, Cr and Pb are the typical metal pollutants due to traffic activities. Emissions of heavy metals from vehicles include fuel combustion, road abrasion, lubricating oil, tire and break wear etc. Through the atmospheric deposit or road runoff, heavy metals can be absorbed into the plant tissues of the pumpkin leaves which are marketed along roadsides.

Cu and Cr are considered as essential elements for various biological activities within the human body, elevated levels of these metals can affect consumer health negatively. Apart from being an important biocatalyst in the body, copper is essential for body pigmentation, maintenance of the central nervous system, preventing anaemia and it is associated with the functions of Fe and Zn in the body (Jarup, 2003). Most plants contain inadequate amounts of copper for normal growth and are regularly

provided through the application of artificial or organic fertilizers (Chen *et al.,* 2014). Copper toxicity can induce lipid peroxidation, iron deficiency and membrane destruction within the body. Chromium is also an important trace metal required to stabilize the blood glucose levels, which in turns reduce the occurrence of diabetes, by the efficient use of insulin. It aids the breakdown of lipids in the body and increases the HDL cholesterols in the body while reducing the LDL cholesterol. Ingestion of high doses of chromium can cause irregular heartbeat, stomach distress, itching and flushing in human. In addition chromium can cause ulceration, liver and kidney damage (Jarup, 2003).

Cd and Pb are non-essential toxic elements which cause carcinogenic effects and teratogenic abnormalities in human, even at very low concentrations (Nazar *et al.*, 2012). Pumpkin leaves have the capability to accumulate Pb from the soil as well as from the atmosphere through their leaves. Lead has been reported as a severe cumulative body toxin which enters the body through food, air and water and cannot be eliminated by washing the vegetables (Abbas *et al.*,2010)

Accumulation of Cd in plants affects the nutrients uptake, obstruct the respiratory enzymes, carbohydrate metabolism, photosynthesis, alter the antioxidant metabolism, and reduce the crop productivity Within the human body, Cd irreversibly accumulates in the kidneys, liver and lungs(Sobukola *et al., 201*0). The kidneys and liver synthesize a Cd-inducible protein (metallothionein) which protects the cells by firmly binding with the toxic Cd ion. However, long-term ingestion of Cd might cause prostate, renal and ovarian cancers (Nasar *et al.*,2012).

5. CONCLUSION

Pumpkin leaf is a common vegetable for the inhabitants of the study area and this study has revealed high accumulation of heavy metals (Cr , Pb, Cd) from Tai Expressway which is also experiencing pollution activities and emissions of heavy metals from vehicles (fuel combustion, road abrasion, lubricating oil, tire and break wear). Through the atmospheric deposit or road runoff, heavy metals can be absorbed into the plant tissues of the pumpkin leaves which are marketed along roadsides. The concentration of heavy metals in pumpkin leaves from Tai Expressway were significantly higher than the WHO/ FAO maximum acceptable limit for food. This therefore implies that regular consumption of these vegetable will expose the consumers to heavy metal toxicity as the years go by and this calls for serious health concern as heavy metals are bioaccumulative in human organs and tissues and thus causing various diseases and disorders, if they are not properly controlled.

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