DETERMINATION OF LEAD CONTENT OF PUMPKIN LEAF (*TELFAIRIA OCCIDANTALIS*) SELECTED FROM TOWNS WITHIN THE THREE ECOLOGICAL ZONES OF DELTA STATE

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ABSTRACT

In recent years, there has been growing interest in monitoring heavy metal concentration of edible vegetables. Consumption of foods and vegetables contaminated with heavy metal is a major source of health problem. Therefore, this study was carried out in 15 selected towns in Delta state, covering the three ecological zones of the state, of five towns from each zone. Lead content of pumpkin leaf (*Telfairia occidantalis*) from these towns were determined using the Atomic Absorption Spectrum (AAS). This study showed significant difference ($p<0.05$) in lead concentration between the three zones, with the fresh water swamp forest zone showing the highest mean concentration (0.39±0.17) when compared with the other two zones 0.20±0.11 and 0.25±13 respectively. Although this study did not reveal toxic levels of lead concentration over the accepted standard limits of 0.5mg/100g approved by WHO and FAD, consumers of pumpkin leaf in these towns should not be exposed to any risk associated with daily intake of 0.2mg/day. Observation from this investigation reveals that pumpkin leaf cropped within Delta State is relatively safe for human consumption with respect to lead level.

INTRODUCTION:

Pumpkin leave (*Telfairia occidantalis*) is an important staple vegetable grown in Nigeria both for its nutritional and medicinal values in Delta State. Delta State which is located in the South-West region of Nigeria and vegetables are part of the daily diets in many households forming an important source of vitamins and minerals required for human health (Shah *et al*., 2006). It is likely that plants and vegetables will continue to be a valuable source of new molecules which may after possible chemical manipulation provide new and improved drugs (Shah *et al*., 2006). Vegetables constitute an important part of the human diet since they contain carbohydrates, proteins, vitamins, minerals as well as trace elements. The contamination of vegetables with heavy metals due to soil and atmospheric contamination poses a threat to its quality and safety. Dietary intake of heavy metals also poses risk to animals and human health and food contamination is one of the important pathways for the entry of these toxic pollutants into the human body (Ferner, 2001; Ma *et al*., 2006). High concentration of heavy metals such as copper, cadmium and lead in fruits and vegetables were related to high prevalence of upper gastrointestinal cancer (Turkdogen *et al*., 2003). Many anthropogenic sources such as waste incineration, industrial processes and also vehicular traffic emits heavy metals in the atmosphere. This study attempts to establish the level of lead contamination of pumpkin leaves (*Telfairia occidantalis*) in selected towns in Delta State, covering the three ecological zones of the state as well as areas of the State that are exposed to hazards from lead consumption through vegetables, with the hope that efficient and dynamic management strategy could be properly initiated especially when locations of high risk are uncovered.

Study area and period: This study was carried out in five different locations (towns) in each of the three ecological zones of the Delta State, which are the Rain forest (Obiaruku, Agbor, Asaba, Abbi and Umunede); Fresh water swamp forest (Abraka, Eku, Warri, Sapele and Ughelli) and Mangrove swamp forest (Oleh, Ozoro, Oyede, Irri and Iyede). Duration of study was for two months during the dry season (November-December, 2011) during which the plant was irrigated. The vegetable samples were collected from sites from the three zones, based on the anticipated contamination of the land used for dumping waste as well as industrial activities.

MATERIALS AND METHODS

Plant material: The fresh pumpkin leaves (*Telfairia occidantalis*) were collected from five different locations (towns) in each of the three ecological zones of the State. They were identified by Dr. Ebigwai of the Botany Department of Delta State University, Abraka. Two samples of the vegetable were collected fortnightly making a total of 8 samples of the vegetable per site (40 per zone, 120 in total for the three zones) by the end of the two months period. All samples were collected and stored in individual polythene bags before being brought to the laboratory for analysis.

Vegetable sample preparation: The method as described by Rodrigues-Flores and Rodriguez-Castellon (1982) was adopted. Freshly collected plant material was weighed and sun-dried for two weeks and the dried sample were macerated into uniform powder using Thomas Contact Mill (Pyeunicam, Cambridge, England). Two grams of the sample was weighed in 100ml conical flask, 25ml of aqua-regia mixture (70% high purity HNO_3 and HCl) and 5ml 30% H_2O_2 were added to the sample. The mixture was heated at 80^{o}C for 3 hours in other to obtain ash. After ashing the ash was dissolved using 20 ml of deionized water and then filtered using Whatman NO. 42 filter paper to complete digestion of organic matter. The solution was then transferred in a volumetric flask, made up to 50ml mark and then allowed to settle for at least 2 hours. A Unicam 919 atomic absorption spectrophotometer (Cambridge, UK) was used to analyze the samples. All stock standard solutions of lead were prepared as per instruction manual of Unicam 919. A standard air-acetylene flame was used in all determinations. A wavelength of 283.3 nm was used for lead.

Data analysis: Analysis of variance (ANOVA) of the means of the detected quantities of the metal was carried out using the SAS (1989) statistical software.

RESULTS AND DISCUSSION

Some towns in developing countries receive atmospheric deposition of heavy metals which result in contaminations of fresh vegetable in the farm even during transportation and marketing (Abdulla and Chmielnicka, 1990). Consumption of contaminated vegetable may pose risk to human health. Lead determined in pumpkin leaf from these locations showed that the concentration of lead did not exceed the safe limit of the test vegetables according to FAD/WHO (Codex Alimentarius Commission,1995).

Table 1: Concentration (mg/100g) of lead in the sample in selected towns

Location	Conc. (mg/100g)	Location	Conc. (mg/100g)	Location	Conc. (mg/100g)
Rain Forest		Fresh Water Swamp Forest		Mangrove Swamp Forest	
Abraka	0.33±0.07(n)	Asaba	0.25±0.08(n)	Oleh	0.22±0.09(n)
Eku	0.26±0.09(n)	Agbor	0.25±0.17(n)	Ozoro	0.25±0.13(n)
Warri	0.47±0.15(n)	Umunede	0.17±0.07(n)	Oyede	0.23±0.15(n)
Sapele	0.49±0.20(n)	Ibusa	0.11±0.09(n)	Irri	0.23±0.09(n)
Ughelli	0.41±0.10 (n)	Obiaruku	0.20±0.15(n)	Iyede	0.29±0.13(n)
Mean±SD	0.39±0.17^a		0.20±0.11^b		0.25±0.13^c

Values are expressed as Mean ± SD, n = number of sample per site (8). Columns with subscript are significantly (p<0.05) different from each other. ***FAO/WHO Level*** *= 0.5mg/100g*

From the result tabulated above (Table 1), there is significant difference in the lead content of pumpkin leaf from the three ecological zones of Delta state which is also in agreement with the activities going on in such locations. This difference could be due to difference in soil type and composition in these locations. Vegetables from the fresh water swamp forest ecological zone was found to have highest lead content when compared with the other two zones. The high lead content as observed in the pumpkin leaf in this zone could be as a result of several factors ranging from the elicit dumping of refuse on road side as well as the high industrial activity carried out in such location. Effluents from industrial waste and dumping sites increases the lead content of the soil from which the plants absorb lead via their roots. This implies that the higher the lead content of the soil, the higher the lead content of pumpkin leaf planted on that soil. The high emission from automobile cars and heavy traffics from industrialized towns of Warri and Sapele which contains lead found in fuel as antiknock agent could also be a factor for which the lead content of pumpkin leaf in this zone was higher than the other districts. These emissions results in the contamination of the air and the soil on which the vegetables are planted (Kashem and Singh, 1999). Chambers and Slid (1991) found out that plant lead level highly varies when related to soil lead levels. Also according to Fleming and Parle (1977), the uptake of lead and other heavy metals varies widely depending on the plant species being studied. They also found out that lead uptake was controlled by such variables as pH, organic matter content and soil type. These variations observed might greatly be responsible for changes in the lead content of pumpkin leaf from these study areas or locations. Generally most of the heavy metals are less available to plants under alkaline conditions than acidic conditions as reported by Aitken (1997). This could also be a reason for the higher lead content of pumpkin leaf in locations in the fresh water swamp forest zone. Soils in this zone are more acidic than the other two.

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