

Short Communication

Lead and Cadmium Levels of Five Commonly and Widely Consumed Leafy Vegetables in Kano State, Nigeria.

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ABSTRACT: The levels of the hazardous metals (Pb and Cd) in five different leafy vegetable plant samples (viz: *Hibiscus cannabinus*, *Cassia tora*, *Vernonia amygdalina*, *Corchorus olitorius*, and *Corchorus tridens*) consumed by Kano inhabitants were investigated and found to be at concentration below the environmental lead action level set by US EPA/WHO. Cadmium was not detected in the samples. Low concentration of Pb and absence of Cd in all the plant samples analyzed are clear indication that these may not exhibit toxicity effects due to any of these metals. The consumers are therefore safe from their toxicity effect.

Keywords: Lead, Cadmium, Leafy Vegetables, Kano, Nigeria.

INTRODUCTION

Leafy vegetable plants play a vital role in the diet of the inhabitants of Kano. Many workers reported that these leafy vegetables could be rich sources of minerals, although the bioavailability, pollution and other anti-nutritional factors considered to interfere with digestion and absorption of these minerals in the body have to be established.

Heavy metals have been reported to have both positive and negative roles in human life (Adriano, 1984; Dundar and Saglam, 2004). Some like cadmium, lead and mercury are major contaminants of food and may be considered an important problem to our environment while others like iron, zinc and copper are essential for biochemical reactions in the body (Zaidi *et al.*, 2005). Generally, most heavy metals are not biodegradable, have long biological half-lives and have the potential for accumulation in the different body organs leading to unwanted side effects (Jarup, 2003; Sathawara, *et al.*, 2004). There is a strong link between micronutrient nutrition of plants, animals and humans, the uptake and impact of contaminants in these organisms (De-Leonardis *et al.*, 2000; Yuzbasi *et al.*, 2003; Baslar *et al.*, 2005; Yaman *et al.*, 2005). The content of essential elements in plants is affected by the characteristics of the soil and the

ability of plants to selectively accumulate some metals (Divrikli *et al.*, 2006)

Leafy vegetable are widely used for culinary purposes. They are used to improve the quality of soup and also for other dietary purposes (Sobukola *et al.*, 2007). They are made up of chiefly cellulose, hemi-cellulose and pectin that give them their texture and firmness (Sobukola and Dairo, 2007). Fresh vegetables are of great importance in the diet because of the presence of vitamins and mineral salts. They are very important protective food and useful for the maintenance of health and the prevention and treatment of various disease (D' Mellow, 2003). However, these plants contain both essential and toxic metals over a wide range of concentration (Radwan and Salama, 2006).

Based on persistent nature and cumulative behaviors as well as the probability of potential toxicity effect of heavy metals as a results of consumption of leafy vegetables and fruits, there is needs to test and analyze these foods items to ensure that the levels of these trace elements meet the agreed international requirements. This is particularly important for farm products produced from this part of the world where only limited data on heavy metals contents of such highly consumed agricultural material are available (Sobukota *et al.*, 2010). Many workers have

reported different levels of trace metals in vegetables. Anyoola *et al.* (2010) reported the trace elements and major minerals of *Spondias mumbin*, *Vernonia amygdalina* and *Momordica charantia* leaves. Asaolu and Asaolu (2010) reported the trace metal distribution in Nigerian leafy vegetables, which include *Corchorus olitorius*, *Grassocephilium crepodes*, *Senecio biodrae*, *Ammarantus caudus* and *Talium triangulase*. Sobukola *et al.*, (2010) studied the heavy metal levels of some fruits and leafy vegetables from selected markets in Lagos, Nigeria. e.t.c.

Materials and Method

Sampling

Five commonly and widely consumed leafy vegetables in Kano, Nigeria were selected for analysis. The varieties are viz; *Hibiscus cannabinus*, *Cassia tora*, *Vernonia amygdalina*, *Corchorus olitorius*, and *Corchorus tridens*. The vegetables were purchased from “Yan-Kaba market in Kano city, Nigeria.

Sample Preparation

The leaves were separated in each case and they were cut into pieces, washed, and air dried on the laboratory benches and then dried in the oven at 80°C for six hours. The dried materials were grounded into powder using mortar and pestle. 2g of each powdered component were weighed and digested as reported by Anjorin *et al.* (2010). The digest were analyzed for the mineral contents using Buck scientific model 210VGP atomic absorption spectrophotometer.

Wet Digestion Method

Two grams of each of the powdered samples was weighed into separate beakers and treated with 20cm³ of concentrated HNO₃ heated to reflux on an electric hot plate at 70-90°C for 60mins. The content of the beaker is allowed to cool, filtered through Whatman No. 42 filter paper into volumetric flasks and made up to 100cm³ with de-ionized water and kept for analysis. Blank was also prepared in similar manner (Anjorin *et al.*, 2010).

Instrumentation

Metal concentrations were determined on a Buck scientific model 210VGP Atomic Absorption

Spectrometer (AAS). The result of each sample was the average of three replicate readings. A calibration curve of absorbance against concentrations of each element under investigation was constructed and finally the concentration of each element was determined from the calibration curve of its standards by interpolation.

RESULTS AND DISCUSSION

Lead (Pb)

In all the samples analyzed Pb levels was observed to vary from 0.048 mg/g in the leaves of *Vernonia amygdalina* to 0.119mg/g in the leaves of *Cassia tora* as shown in figure 1. Among the values reported previously for leafy vegetables. Dike (2010), reported *Vernonia amygdalina* to have 0.0082 mg/g. Asaolu and Asaolu, (2010) also reported mean concentration of Pb in *Corchorus olitorius* to be 0.05mg/g. The values reported by Asaolu and Asaolu,(2010) are not significantly different from those reported in this work. Although the highest Pb level of 0.119mg/g as found in the leaves of *Cassia tora*, the value which has not exceed the environmental lead action level set by US EPA/WHO as reported by Mary (2009). Therefore the lead levels in the leafy parts of the vegetables analyzed seems not to be alarming except in a case of excessive consumption. Lead is non essential element in foods and natural waters. Automobile-exhaust ashes, batteries, bone meals, cigarette, petrol and lead accumulators/batteries are implicated as common sources of Pb in the environment (Nielson, 1996). Knowing the toxicity effect and the essentialities of some of the trace metals in the environment on human health, it is of paramount importance for food hygienist and health authorities to be familiar with available information on some of the hazardous metal content of our food like the leafy vegetables (Asaolu and Asaolu, 2010). This information may serve as a guide to the nutritional value and pollution potential of some leafy vegetables due to their mineral contents.

Cadmium (Cd)

Cadmium is also a non-essential element in foods and natural waters and it accumulates principally in the kidney and liver (Sobokola *et. al.*, 2010). Cd was observed to be absent in all the samples

analyzed. However some authors like Asaolu and Asaolu (2010) reported low cadmium concentration of 0.014mg/g in the leaves of *Corchorus olitorius* while Sobokola *et. al.* (2010) reported *Vernonia amygdalina* to have mean Cd

concentration of 0.0006mg/g. Being Cd among the non-essential elements in foods, its absence in these plants indicate that the plants contribute nothing to the toxic effects of this non-essential element.

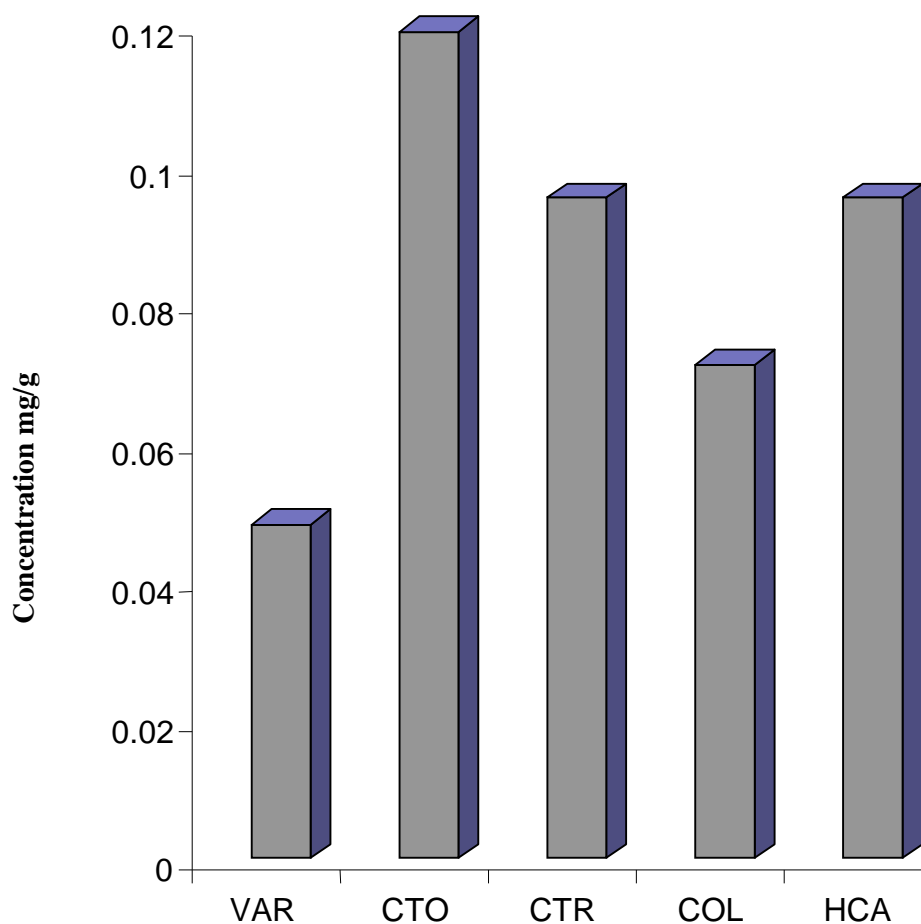


Fig 1; Mean concentration of Pb in leaves of samples analyzed

Key: VAR = *Vernonia amygdalina*, CTO = *Cassia tora*, COL = *Corchorus olitorius*,
CTR= *Chorchorus tridens*, HCA= *Hibiscus cannabinus*

CONCLUSION

The goal of this study was to assess and compare the Pb and Cd contents of five leafy vegetables that are widely consumed by the inhabitants of Kano, Nigeria. Low concentration of Pb and absence of Cd in all the plant samples analyzed are clear indication that these plants contribute little or nothing to the toxic effect of these metals, and hence they can be consumed without fear of Pb and Cd toxicity.

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