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## A Comparative Evaluation of Heavy Metals in Commercial Wheat Flours Sold in Calabar-Nigeria

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**Abstract:** The concentrations of heavy metals in commercial brands of wheat flours sold in Calabar-Nigeria were evaluated using Flame Atomic Absorption Spectrophotometer. The result of the analysis table showed the concentrations of the Heavy metals to be Cd (0.002 mg/kg) Cr (0.012 mg/kg) Cu (0.016 mg/kg) Fe (0.040 mg/kg) Ni (0.006) and Zn (0.019 mg/kg) for Dangote flour samples and Cd (0.0004 mg/kg) Cr (0.006 mg/kg) Cu (0.034 mg/kg) Fe (0.020 mg/kg) Ni (0.060 mg/kg) for Golden penny flour sample. Mn, Pb, As and Hg were not detected in all the samples while Zn was only detected in Dangote flour. The results revealed the heavy metals concentrations to follow the trend Fe > Zn > Cu > Cr > Ni > Cd for Dangote flour and Ni > Cu > Fe > Cr > Cd for Golden Penny flour. **Keywords** Heavy Metals. Golden Penny, Dangote Wheat flour.

**Key words:** Heavy metals, wheat flours, flame atomic absorption spectrophotometer

### INTRODUCTION

Wheat is one of the important crops that serve as stable food for most people in Nigeria.

It is a member of the cereal or grain in the family Graminee and the genus *triticum*.

There are various varieties of the wheat but the one used for this study is the TRITICUM COMPACTUM also known as soft wheat used for the production of flours for confectionaries such as Breads, cakes, Biscuits, pastries etc. It is also used for the production of baby foods and in brewing industries as replacement for flaked barley or maize (Elieser and Arthur, 1997). Wheat flour is consumed calabar mainly as bread and other confectionaries such as cakes and pies. The wheat used in the production of the flours may have been grown on farmlands with high concentration of heavy metals or the farmland upon which the wheats were grown may have been watered with water from sources with high concentration of heavy metals (Smith *et al.*, 1996; Osu and Odeemelamo, 2007). Also the process of flour making involved the use of high technology, which is known to promote high turns over of products.

This process is also known to be a source of heavy metal contamination of wheat flour (Gulfrazi *et al.*, 2003). Toxic effects of these heavy metals have been widely described by many workers. Elements such as Cd, Cr and As are considered carcinogenic, while Fe, Cu, Zn, Ni and Mn are considered as essential metals, however, if the concentrations of the later elements are higher than their permissible limits they may create toxic effects in human (Gulfrazi *et al.*, 2003). Manufactured food products from wheat flour are consumed on daily bases and these metals tend to bioaccumulation in the human body over time.

The constant exposure to very low levels of elements such as lead, cadmium and mercury have been shown

to have cumulative effects since there is no homeostatic mechanism which can operate to regulate their toxicity (Carter and Fernando, 1979; Yeast and Brewers, 1983). The toxic effect of heavy metals in human arising from the consumption of products with high concentration of these metals, have been described by many workers (Segura *et al.*, 2006; Davis *et al.*, 1994; Nierendbery *et al.*, 1998; Linder *et al.*, 1998). Many researches have been carried out on the levels of heavy metals in vegetables, fish and fruits in many parts of the world (Gulfrazi *et al.*, 2003; Segura *et al.*, 2006; Edem *et al.*, 2008a; Edem *et al.*, 2008b; Asuquo *et al.*, 1999; Adediran *et al.*, 1990; Aweke and Taddese, 2004; Davis-Oku *et al.*, 2006; Netkim *et al.*, 1993; Mwaedozie, 1998; Obodo, 2002; Oladimeji, 1986; Onyedika and Nwosu, 2008; Edem *et al.*, 2008b; Mannino, 1996; Cheng, 2003; Tahoven, 1998; WHO, 1991; Fubara and Christian, 2006). There have been little or no information on the levels of heavy metals in the wheat flours manufactured and sold in calabar the capital of Cross River State of Nigeria by the 2 flour mills whose products are used in this study.

The aim of this study is therefore to evaluate and compare the concentrations of heavy metals in the wheat flours produced by the two flour mill companies located in calabar cross river state with the view of knowing the health effect associated with the consumption of these products.

### MATERIALS AND METHODS

**Sample collection:** The 120 g of golden penny and Dangote brands of wheat flour produced by Niger mill Nigeria plc and Dangote flour mill plc both in calabar were purchased from Watts and Ika-Ika Oqua markets also in calabar cross river state between the months of May and June 2007. All the samples were kept in a refrigerator as purchased until the time of used.

Table 1: Concentration of Heavy Metals in Dangote and Golden penny Wheat flours (mg/kg) dry weight

Samples	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Ni (mg/kg)	Mn (mg/kg)	Zn (mg/kg)	Pb (mg/kg)	As (mg/kg)	Hg (mg/kg)
Dangote Flour	0.002	0.012	0.016	0.040	0.006	Nd	0.019	Nd	Nd	Nd
Golden penny Flour	0.004	0.005	0.034	0.020	0.060	Nd	Nd	Nd	Nd	Nd

**Sample preparation and analysis:** All the samples of each brand of products obtained from the 2 markets were blended together using a mixer into a composite sample and then used for the analysis. 5.0 g of each sample was weighted out into a platinum foil and dried. The dried samples were the ashes produced were digested with 20 mls of 1.1 (v/v) HNO<sub>3</sub> and HCL acid in 100 mL beaker. The digests were filtered and the filtrates were diluted using de-ionized water to 100 mls and 2 mls aliquots used for the heavy metals determination using flame atomic absorption spectrophotometer (Buck scientific, model 210 VGP, USA) using aqueous calibration standards prepared from stock standard solution of the respective elements (buck scientific) according to Aweke and Taddese (2004).

**RESULTS AND DISCUSSION**

The result of the analysis (Table 1) shows the concentration of the heavy metals to be Cd (0.002 mg/kg) Cr (0.012 mg/kg) Cu (0.016 mg/kg) Fe (0.040 mg/kg) Ni (0.006 mg/kg) Zn (0.019 mg/kg) for Dangote flour and Cd (0.004 mg/kg) Cr (0.006 mg/kg) Cu (0.034 mg/kg) Fe (0.020 mg/kg) and Ni (0.060 mg/kg) for Golden penny flours. Mn, Pb As and Hg were not detected in all the samples, while Zn was only detected in Dangote flour.

The result of the analysis showed that Fe (0.040 mg/kg) has the highest concentration in Dangote flour followed by Zn (0.019 mg/kg), Cu (0.016 mg/kg), Cr (0.012 mg/kg), Ni (0.006 mg/kg) and Cd (0.002 mg/kg) with the distribution pattern of Fe> Zn>Cu>Cr>Ni>Cd. While Ni (0.060 mg/kg) has the highest concentration in Golden penny flours followed by Cu (0.034 mg/kg), Fe (0.020 mg/kg), Cr (0.006 mg/kg) and Cd (0.004 mg/kg) with the distribution pattern of Ni>Cu>Fe>Cr>Cd. The result reveals that Cd (0.002 mg/kg) has least concentration both flours. While Ni has the highest concentration of (0.060 mg/kg) in Golden penny flour, followed by Fe (0.040 mg/kg) and Cu (0.034 mg/kg) both in Dangote flour.

The concentration of the heavy metals obtained in this studies were shown to be lower than those reported by Onyedika and Nwosu (2008) and Edem *et al.* (2008a,b) which means that the products are fit for consumption and do not pose any threat to the health of their consumers in the study area.

**Conclusion:** The result of this study has revealed that the various concentrations of the heavy metals Cd, Cr, Pb, Cu, Ni, Zn and Fe in Golden penny and Dangote brands of wheat flours sold in Calabar, South East of Nigeria.

The concentrations of these heavy metals are within the acceptable range and do not pose any threat to the health of their consumers.

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