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Determination of some heavy metals in baked beans

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Abstract
This study aim to determine the level of some heavy metals in baked bean samples in Maiduguri metropolis Borno State, Sample collection and preparation were carried out using atomic absorption spectrophotometer (A.A.S). The concentration of all the metals studied was observed to be present in tolerable levels lower than the maximum tolerated limit as given by World Health Organization (WHO). Based on the research findings the baked beans samples studied are safe for human consumption.

Keywords: determine, determination, baked, metals

Introduction

Demand for healthy food and balanced nutrition as well as the need to maintain sustainable production systems can be satisfied to some extent by increasing the production of legumes, including dry bean seeds (Peksen 2005) [3]. The concept of sustainable agricultural systems may be summarized as a continuous and long-lived production system, viable in terms of both yields and consumer benefits, and achieved through a combination of experience and modern techniques for some purposes such as environmental protection, economic development, prevention of migration from rural areas and enhancement of the living standard. The increasing human population has led to a reduction in the total coverage of agricultural areas and a development of intensive agricultural models that shift the focus to the achievement of higher yields by using more chemical fertilizers and pesticide.

Heavy metals have metallic characteristics, which are described by various features based on the number of atoms, atomic weight, density, chemical structure, toxicity, etc., small amount of these elements are essential for humans and animals consumption, while higher quantities have toxic effects.

Quantities of metals above their essential values create "a metal load in an organism" and some of them (such as aluminum, cadmium and lead) increase in concentration with age. Heavy metal pollution originates from natural resources, mining, industrial waste, detergents, burning fossil matter, urban waste and waste water as well as pesticides and fertilizers' used in agriculture. Factors that nuance the absorption of heavy metals in soil are soil pH, organic matter, and liming soil structure. Toxic elements collected in the soil can be transferred up in the food chain (soil-air-plant- -animal-human).

Some metals, for instance arsenic, cadmium, chromium, cobalt, iron, lead, nickel, titanium and zinc, are known to have carcinogenic effects. Vital heavy metals are essential for organisms in certain concentrations which affect biological reactions. Therefore, these have to be taken to the bodies regularly. From this perspective, agricultural production systems and cultivation practices are important for humans and for the environment (Sebastian, 2016; kahraman 2017) [4, 2].

Compared to other plants, bean is the most important legume in the world, it is sensitive to climate changes, which is why the sowing time affects the yield and nutritional value of this crop, due to the water and temperature factors which issue the growth, development, yield and quality.

Canning is a method of preserving food in which the food contents are processed and sealed in an airtight container. Canning provides a typical shelf life ranging from one to five years, although under specific circumstance. a freeze dried canned product,such as canned,dried lentils, can last as long as 30 years in an edible state. The process was first developed as a French military discovery by Nicolas in the year 1810.

The packaging prevents microorganism from entering and proliferating inside. To prevent the food from being spoiled before and during containment, a number of methods are used in preserving; Pasteurization, boiling (and other applications of high temperature over a period of time), refrigeration, freezing, drying, vacuum treatment. Etc

From a public safety point of view, foods with low acidity (a PH more then 4.6) need sterilization under high temperature (116-130c). To achieve temperatures above the boiling point requires the use of a pressure canner.

Foods that must be pressure canned include most vegetables, meat seafood, poultry, and dairy products. The only foods that may be safely canned in an ordinary boiling water bath are highly acidic ones with a PH below 4.6, such as fruits, pickled vegetables and other foods which acidic additives have been added.

Food chain contamination by heavy metals has become a burning issue in recent years because of their potential accumulation in Bio Systems through contaminated water, food, soil, and air.

Trace heavy metals are important in daily diet, because of their essential nutritious value and possible harmful effects metals like iron, copper, zinc, cobalt, and manganese are essential

metals.Since they play an important role in biological system, whereas mercury, lead, cadmium etc are non-essential metals which can be toxic even in trace amounts. the essential metals can also have harmful effects when their intakes exceed the recommended quantities significantly.

Heavy metals normally occurring in nature are not harmful, because they are only present in very small amounts. however if the levels of these metals are elevated, then they can show negative effect. Indeed, the effect of toxic metals that may result in symptoms and diseases can be classified into two distinct; (a). Direct Toxic Effect that damage tissue and interfere with normal metabolic processes (b) Displacement and/or Depletion of essential nutrients leading to nutritional deficiencies and associated health concerns.

Aims and Objectives

- To determine the concentration of some heavy metals in baked beans samples.
- To assess wither this heavy metals have toxic effect on humans
- To assess if this heavy metals are carcinogenic

Materials and Methods

Apparatus used are as follows:

250ml Beaker, Wash glass, Filter paper, Funnel, 100ml volumetric flask, Hot plate, Weighing balance, Spectrophotometer

Reagents Used

Hydrochloric acid, Concentrated nitric acid, Distilled water, Zinc indicator, Methyl alcohol, Sodium cyanide, Formaldehyde solution, Chromium reagent, Ammonium persuade reagent, Sodium citrate, Pan indicator, Stabilizing reagent, Silver nitrate solution, Hardness buffer reagent

Sample Collection Point

The Baked Beans used in the Research was collected at Mairi kuwait of Jere Local Government Area of Borno State. Nigeria

Methodology

1g of the dried sample was poured into beaker; 10ml of 6m Hcl was added to it and these mixtures was heated on hot plate for about 15 minutes, removed and cooled. 1ml of concentrated nitric acid was added with continuous heating to evaporate N-dryness to dehydrate silica. 1ml of 6m Hcl and 10ml of distilled water was added and heated again to complete dissolution. This mixture was removed from the hot plate, cooled and filtered through a filter paper in a volumetric flask. This was made up with distilled water to the mark of 100ml and keep for further analysis.

Elemental Analysis

100ML of the digested sample was subjected to elemental analysis using atomic absorption spectrophotometer (A.A.S). The elements analyzed were (Zn, Cr, Fe, Cd and Cu).

Result and Discussion

Table below gives the result for the elemental analysis of the baked beans sample.

Table 1

Sample	Mg/Kg	%	WHO standard Mg/kg
Zn	25	30.8	100
Cr	13	16.0	0.8
Cd	3	3.7	0.1
Fe	24	29.6	425
Cu	16	19.7	73

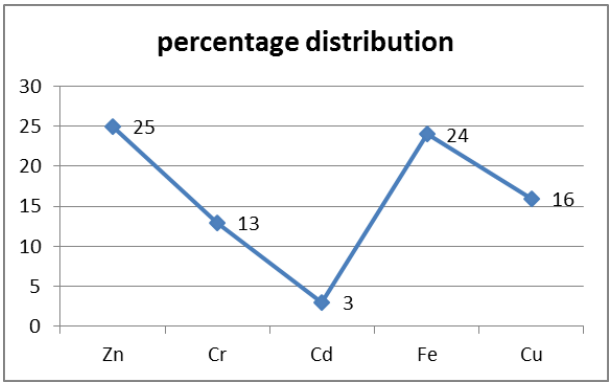

Fig 1

The concentration of heavy metals in baked beans samples is as presented in the table above. The levels of Zn is 25 (mg/kg), 13 (mg/kg) Cr, 3 (mg/kg) Cd, 16 (mg/kg) Cu, 24 (mg/kg) Fe, From the result of the study Zn show the highest concentration while Cd shows the least concentration.

All the five (5) elements analyzed in the sample were found to be present, these element are (Zn, Cr, Cd Fe and Cu). Deficiency of most of these mineral in our nutrition can cause serious Health problem. The understanding of trace element plays an important role in human health and diseases. This understanding has led to more sophisticated and improved methodology for detection of element in human tissues. Some of the major elements that our body uses on a daily basis in order to function optimally are: Nickel, Nitrogen, Oxygen, Phosphorus, potassium, Silicon, sodium, Titanium. Etc

Iron (Fe) this mineral play an important role in the function of blood hemoglobin and cytochromes. It also helps in the formation of myoglobin. Cadmium exposure and human health, it has been well established that excess cadmium exposure produces adverse health effects on human beings for virtually all chemical adverse health effects are noted at sufficiently high total exposure.

Cadmium is not regarded as essential to human life, the relevant question with regard to cadmium exposure are the total exposure levels and principal factor which determine levels of cadmium exposure and the absorption rate of the ingested/inhaled cadmium by an individual in other words,the pathways by which cadmium enters the food chain the principal pathway of cadmium exposure for human beings, human normally absorb cadmium into body either by ingestion or inhalation thermal exposure (up take through the skin) is generally not regarded to be of significance (lauwery 1988)

It is widely accepted (WHO 1992; ATSDR 1997) that approximately 2 percent to 6 percent of cadmium ingested is actually take up into body.

Zinc (Zn) it act as a cofactor of human digestive and other type of enzymes.

Copper is needed in a relatively small amount, its function include formation of hemoglobin in the blood and facilitating absorption and use of iron so that red blood cell can be efficient in blood clothing.

Chromium is an essential mineral that plays a role in how insulin helps the body regulate blood sugar level, insulin is a hormone that our body uses to change sugar, starches, and other food into energy needed for daily life. Through it is clear that chromium is required in a trace amount the exact amount is not understood.

Conclusion and Recommendation

The concentrations of the entire element were determined in all the samples studied. The level of Zn was the highest (25mg/kg) while Cd was least (3mg/kg), although all of them fall below the Maximum Permissible limit as given by WHO. Base on the above finings, the concentration of all the metals studied are not harmful, hence baked beans in this area studied is safe for human consumption.

Government of Borno state in collaboration with National Food Drug Administration and Control (NAFDAC) should establish a Monitoring program for residues and contaminants to improve food safety in the area.

References

1. Filiz UV. Determination of some heavy metal pollution of rice plant in Edirne Region. MSc Disrtation or thesis, Namık Kemal University, Tekirdağ, Turkey, 2011.
2. kahraman A. Nutritional value and foliar fertilization in soybean. J. Elem. 2017; 22(1):55-66. DOI: 10.5601/jelem.2016.21.1.1106.
3. Peksen E. Comparison of some common bean (Phaseolus vulgaris L.) genotypes for seed yield and related characteristics under Samsun conditions. J. of Faculty of Agriculture OMU. 2005; 20(3):88-95.
4. Sebastian a, Prasad MNV. Modulatory role of mineral nutrients on cadmium accumulation and stress tolerance in Oryza sativa L. seedlings. Environ. Sci. Pollut. Res. 2016; 23(2):1224-1233. DOI: 10.1007/s11356-015-5346-1