

Determination of Heavy Metals Concentration in Some Herbs Commonly Consume in JOS North And JOS South Local Government Area of Plateau State, Nigeria.

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Abstract- The effect of high concentration of heavy metals on human health and the environment has attracted considerable attention in recent years as plants are the main route in the transfer of heavy metals from contaminated soil to humans. The aim of this study is to assess the concentration of (Copper, Iron, Lead and Manganese) in some commonly consumed herbs (Mint Leaves, Bitter Leaves, Lemon Grass and Moringa Leaves) in Jos North and Jos South L.G.A. of Plateau state using AAS and compare the result of the heavy metals analysis with WHO Standard limits for heavy metals in plants. The results showed that all the heavy metals in the four herbal plant samples collected from different markets both in Jos North L.G.A and Jos South L.G.A of Plateau State were detected and were above the WHO permissible limit for heavy metals in plants except for Mn (10.87-122.67ppm) which was consistently within the WHO permissible limits of 200mg/kg in all the four herbal plants and also Cu (2.30ppm) which was within the WHO permissible limit of 10mg/kg in Lemon grass in Jos North L.G.A. Similar concentration trend was also observed in Jos South L.G.A with Mn concentration values (24.84-138.20ppm) for all the four herbal plants being within the WHO permissible limit and Cu (8.75ppm) concentration values for Mint and Lemon grass (0.46ppm) were also within the WHO permissible limit for heavy metals in plants.

Index Terms- AAS, Concentration, Herbs, Heavy metals, WHO.

I. INTRODUCTION

Herbs are plants with savory or aromatic properties that are used for flavoring and [garnishing](#) food, in medicine, or as fragrances. It also refers to the [leafy](#) green or [flowering](#) parts of a plant either fresh or dried (Panda, 2015). Some plants contain [phytochemicals](#) that have effects on the body. There may be some effects when consumed in the small levels that typify culinary spicing, and some herbs are toxic in larger quantities (Arrowsmith, 2009). Herbal plants such as mint leaves, bitter leaves, lemon grass, moringa and so on represent an important class of various traditional medicine system. In recent years they are increasingly used in the primary health care intervention both in developed and developing countries. According to the World Health Organization, nearly 70-80% of the world population still

primarily relies on non-conventional medications mostly derived from herbal plants (Sahoo et al., 2010; WHO, 2005). Herbs are traditionally used for the treatment and prevention of ailments such as stomach pain, headache, diabetes, hypertension, rheumatism and many others. According to a recent study on the diversity and conservation states of plants, about 50% of plants species were found to posse medicinal properties (Albraik, 2008). The toxicity of herbal plants may be related to contaminants such as pesticides, microbes, heavy metals, chemical toxics and adulterants. (Rutter, 2008). The geography and geochemical soil characteristics contaminants in the soil, water, air and other growth transportation and strange conditions can significantly affects the properties and the quantity of the herbal plants and their formulation (Rania, 2015).

The toxicity of heavy metals to human health and the environment has attracted considerable attention in recent years. Plants are mainly linked in the transfer of heavy metals from the contaminated soil to humans (Rania et al. 2015). Heavy metals are naturally occurring metals having atomic number (Z) greater than 20 and an elemental density greater than 5g/cm³ (Ali & Khan, 2017). Heavy metals are dangerous because they tend to bioaccumulate.. Compounds accumulate in living things any time they are taken up and stored faster than they are broken down (metabolized) or excreted (Wijayawardena, Megharaj & Naidu, 2016).

Metals such as zinc, copper, iron, manganese and chromium are essential nutrients, they are important for the physiological and biological function of the human body. However, an increase in their intake above certain permissible limit can become toxic (Saad et al,2006). In general, a number of health problem were linked to excessive intake of dietary heavy metals including a decrease in immunological defence, cardiac dysfunction, fetal malformation, impaired psycho-social and neurological behavior, gastrointestinal cancer, and many other (Korfali et al., 2013). The aim of this study is to assess the concentration of (Copper, Iron, Lead and Manganese) in some commonly consumed herbs (Mint Leaves, Bitter Leaves, Lemon Grass and Moringa Leaves) in Jos North and Jos South LGA of Plateau state and compare the result of the heavy metals analysis with WHO Standard limits for heavy metals in plants.

II. MATERIALS AND METHOD

METHOD

COLLECTION AND PREPARATION OF HERBAL SAMPLES

A total of thirty two (32) herbal samples were purchased from four different shops (markets) in Jos North and Jos South L.G.A. of Plateau State, Nigeria. The fresh samples collected were washed with distilled water to remove dirt. The samples were air dried at room temperature for about four weeks. The dried herbal samples were pounded using mortar and pestle, sieved using 2mm mesh, labeled properly and kept until needed.

DIGESTION OF THE SAMPLES

1.0g each of the powdered herbal sample was weighed and transferred into a 250cm³ beaker and was digested with 10ml mixture of analytical grade acids HCl : HNO₃ in the ratio 3:1. The digestion was performed at a temperature of about 60°C for 30minutes in a fume cupboard until it's almost dried. Digested samples were allowed to cooled, filtered into a 100ml volumetric flask, and made up to the mark with deionized water. Atomic Absorption Spectrophotometer (AA-6800) was used determine trace metals concentration in the samples. Duplicate determinations were made.

III. RESULT AND DISCUSSION

RESULTS

TABLE 1:- Heavy metal Concentration (ppm) in Plant Samples (herbs) Sampled from Jos North L. G. A. in ppm.

Elements\Plants	Moringa	Bitter leaves	Mint	Lemon grass	WHO Limit (mg/kg)
Pb	21.92 ± 0.01	24.66 ± 0.23	90.41 ± 0.01	27.40 ± 0.13	10
Fe	1083.33 ± 0.21	154.76 ± 0.03	1190.48 ± 0.07	95.24 ± 0.04	20
Cu	19.80 ± 0.31	15.19 ± 0.01	13.35 ± 0.11	2.30 ± 0.08	10
Mn	66.77 ± 0.31	68.32 ± 0.04	122.67 ± 0.05	10.87 ± 0.03	200

* Duplicate determinations

TABLE 2:- Heavy Metal Concentration (ppm) in Plant Samples (herbs) Sampled from Jos South L. G. A. in ppm

Elements\Plants	Moringa	Bitter leaves	Mint	Lemon grass	WHO limit (mg/kg)
Pb	30.14 ± 0.01	19.18 ± 0.06	27.40 ± 0.13	19.18 ± 0.03	10
Fe	964.29 ± 0.18	178.57 ± 0.11	583.33 ± 0.01	107.14 ± 0.14	20
Cu	13.35 ± 0.23	15.19 ± 0.09	8.75 ± 0.31	0.46 ± 0.10	10
Mn	69.88 ± 0.03	66.77 ± 0.01	138.20 ± 0.05	24.84 ± 0.02	200

* Duplicate determinations

IV. DISCUSSION

From the result of the heavy metal concentration from the herbal plant samples collected from four markets in Jos North L.G.A., it showed that all the heavy metals analyzed were detected in all the samples. For Moringa, Fe recorded the highest concentration value of 1083.33 ppm while Cu recorded the least. The value of 21.92 ppm for Pb was high when compared to WHO limits of 10 mg/kg in plants. The concentration value of Fe was also high as against the value of 20 mg/kg for Fe in plants. Cu recorded the value of 19.80 ppm in this study area and was also higher than the value of 10 mg/kg for Cu in plants. Mn recorded the value of 66.77 ppm. This concentration value was however within the WHO permissible limits of 200 mg/kg for Mn in medicinal plants.

Bitter leaves collected from the four sides in Jos North local Government Area recorded 24.66 ppm for Pb which is higher than the WHO permissible limits of 10 mg/kg for Pb in medicinal plants, 154.76 ppm for Fe as against 20 mg/kg for WHO limits in plants, Cu recorded a concentration value of 15.19 ppm and also exceeded the WHO limit and Mn recorded a concentration value of 68.32 ppm and was within the WHO permissible limit of 200 mg/kg.

Mint leaves from the four sample sites in Jos North L.G.A. showed higher concentration of Pb, 90.41 ppm, Fe, 1190.48 ppm, Cu, 13.35 ppm which were all above the WHO permissible limits except for Mn which had a value of 122.67 ppm and was within the WHO permissible limit but however higher than the concentration of Mn in Moringa, Bitter leaves and Lemon grass. Lemon grass from the four samples sites had concentration of Pb (27.40 ppm) above the WHO permissible limit of 10 mg/kg and 20 mg/kg for heavy metals in plants. Although the concentration value of Fe, Cu and Mn in Lemon grass are far lower than that of Moringa, Bitter leaves and mint. The concentration value of 2.30 ppm for Cu was however within the WHO limit of 10 mg/kg for Cu in plants. Mn concentration value of 10.87 ppm was also within the WHO limits for Mn in plants.

In Jos South, the concentration value of moringa, recorded for Pb showed higher concentration value of 30.14 ppm than Jos North and the value was also above the WHO permissible limits for Pb in plants. Fe in Moringa recorded a concentration value of 964.29 ppm and is lower than the concentration of Fe in Jos North and is also higher than the WHO permissible limits for Fe in plant. Cu concentration value of 13.35 ppm is lower than the Cu concentration value in Jos North but was not within the WHO permissible limit for Cu in plants. Mn recorded a concentration value of 69.88 ppm and is within the WHO permissible limits.

The concentration value of Bitter leaves for heavy metals in Jos South was within the same range as that of Jos North except for Pb which was a little bit low in concentration in Jos South. However, Pb, Fe and Cu were above the WHO permissible limit of heavy metals in plants except for Mn which was within the WHO permissible limit of 200 mg/kg in plants.

The concentration of heavy metals in Mint plants sample from the four sites in Jos South L.G.A. showed lower concentration value for Pb, Fe and Cu when compared to the concentration values recorded in Jos North L.G.A. for mint plants. Cu and Mn recorded the lowest concentration value of 8.75 ppm and 138.20 ppm respectively which were within the WHO permissible limit of Cu and Mn in plants.

Lemon grass in Jos South L.G.A. recorded lower value for Pb and Cu when compared to Jos North L.G.A. The concentration of Fe and Pb were above the WHO permissible limit for Fe and Pb in plant sample while Cu and Mn had concentration values that were within the WHO permissible limit for Cu and Mn in plant. Generally from the result obtained, it was observed that all of the four herbal plant sample studied, Lemongrass has a low affinity for heavy metal uptake while mint plant showed a high affinity for heavy metal uptake. This may be due to several factors like soil type, type of activities in the area, the atmospheric condition of the area, the type of plant etc. There is an increasing need for the herbal sellers to be educated on the effect of harvesting these plants in sites prone to heavy metal contamination as it poses serious health challenge to the consumer of these herbs in the long run.

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