Assessment of Heavy Metals of Some Selected Medicinal Plant in Kwakwachi Fagge Local Government of Kano State, Nigeria

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***Abstract*: This study was carried out to assess the level of heavy metal content of five selected medicinal plants locally consumed in Kwakwachi Fagge local government of Kano state. The concentration of heavy metals (Pb, Cd, Cr, and As) were determined in Azadirachta indica (neem leaf), Vernonia amygdalina (bitter leave), Anacardium occidental (cashew leave), Citrus sinensis (orange) and Citrus limo (lemon) samples using Atomic absorption spectrophotometer. The concentration of the metals in all the medicinal plants were found to be Pb 1.84-5.12 mg/l, Cd 0.6-0.84 mg/l, Cr 0.24-0.6 mg/, As 1.6-10.2 mg/l. The result obtained from study showed that arsenic has the highest concentration in all the medicinal plants. The levels of the various heavy metals in the medicinal plant samples studied were found to be in order of As>Pb>Cd>Cr. The concentration of heavy metals in the plant samples exceeded the permissible limit of W.H.O (2006). The result indicates potential heavy metal risk as a result of the consumption of the mentioned traditional medicine in the study area.**

***Keywords*: Medicinal plant, heavy metal and Atomic absorption spectrophotometer.**

I. INTRODUCTION

Heavy metals include lead cadmium, zinc, copper, Iron etc (Duruibe *et al*., 2007). Heavy metals are among the major contaminant of food supply and are considered as problem to the environment (Zaidi *et al*., 2005). Heavy metals contamination may occur due to irrigation with contaminated water, the addition of fertilizers, metal based pesticides, industrial emissions, transportation, harvesting process and storage. Advancement in technology has lead to high levels of industrialization leading to the discharge of effluent bearing heavy metals into our environment. Medicinal plants play a major role in health care sector of developing nations for the management of diseases. Thus herbal medicines have a prominent role to play in the Pharmaceuticals markets and health care sector of the 21st century. Medicinal plants have found extensive use in disease treatment, prevention and management. Due to the immense benefits herbal population in one way or the other depends on them for various health benefits. Oyedele *et al*., (2008).

According to the World Health Organization (W.H.O) report, there is an estimate of 65 to 80 % of the world's population relying on traditional medicine as their primary source of health care. The use of herbal medicines has come under scrutiny due to their perceived long-term toxicity among other considerations. The causes of the toxicities which could be attributed to the chemical and mineral contents of various plants are also linked to the source of the material. The mineral contents of medicinal plant species used in herbal formulations cannot be overlooked considering the important role these minerals play in the proper functioning of the vital organs as well as in the population of the general well -being of the body. However, they may be toxic if consumed beyond their estimated safe daily intake. Several works have been reported on the phytochemical and biological activities of medicinal plants, although there is little in regard to the heavy metal contents of these plants. Medicinal herbs can present health risk due to the presence of toxic metals such as leads, Cadmium, Arsenic, Mercury, and Copper which are hazardous to humans.

II. MATERIALS AND METHODS

Materials

Measuring cylinder**,** Weighing balance**,** 250ml beaker**,** Sieve**,** Mortar and pestle**,** Atomic Absorption Spectrophotometer (A.A.S)**,** Plastic container **,** Volumetric flask **,** Neem leaf**,** Bitter leaf**,** Cashew leaf **,** Orange leaf **,** Lemon leaf, HNO_3**,** HCl.

Methods

Sample Collection

Leaves of neem, bitter leaf, cashew, orange, lemon plants was harvested from kwakwachifagge local government, Kano and authenticated at Biological Science Department of Ahmadu Bello University Zaria.

Sample Treatment

All leaves of the plants were washed with fresh running water to remove dirt, dust and other contaminated agents. Furthermore, the plants sample was air dried at room temperature. The sample was placed in an oven at100 °C for 15 minutes to further reduce the moisture content. The dried sample was grinded into powder using pestle and mortar and sieved using 0.5mm sieve. The powdered sample was kept in plastic containers separately for pre-treatment.

Digestion Procedure for Plant Samples

The dried powdered (0.5g) was weighed into 50ml of beaker and 30 ml of aqua regia (1:3 HNO_3 and HCl) was added. The sample was placed on hot plate and boiled at 80^{o}C. After the appearance of colourless fumes, the digest was allowed to cool. This procedure was repeated the same way to the remaining samples and deionized water was added to the sample after cooling and filtered into 100cm^3 volumetric flask (Linda *et al*.,1974).

Determination of heavy metals using A.A.S

The heavy metals was analysed using the Atomic Absorption Spectrophotometer (A.A.S). Absorption Spectrophotometer instrument works based on Beer-Lamberts law,

$\log_{10} Io/It$ = abc

III. RESULTS AND DISCUSSION

Table 3.1: Shows the concentration of heavy metals in the selected medicinal plants (Mg/l).

Sample	Lead	Cadmium	Chromium	Arsenic
Neem	1.84	0.84	0.6	5.6
Bitter Leaf	3.84	0.84	0.48	2.48
Cashew	2.4	0.84	0.48	1.6
Orange	5.12	0.6	0.48	9.8
Lemon	2.48	0.6	0.24	10.2
W.H.O Standard (2006).	0.05	0.00002	0.05	0.05

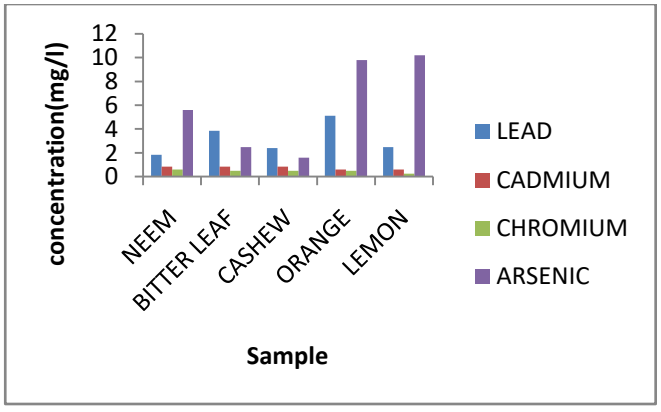

Figure 3.1; Bar chart showing concentration of heavy metals in the five selected medicinal plants.

IV. DISCUSSION

A number of factors govern the extent of heavy metals accumulation and distribution in soil and plants. Contamination of medicinal plants by heavy metals is of major concern because of the toxicity persistence and bioaccumulative nature of such metals, resulting from environmental pollution of heavy metals from road traffic emission, the environment is polluted by heavy metals released during different operations of road transport (Zhang *et al*., 2012;Ikem*etal*., 2003). From the result in Table 3.1 above, the concentration of Pb ranges from 1.84 -5.12mg/l. The high concentration of Pb may be attributed to the high level of traffic and vehicular emission along Kastina road.Pb is one of the most toxic metals thus W.H.O (2006) permissible limit of Pb is 0.05mg/l. Excessive intake of Pb will result to neurological disorder, anemia, kidney damage, miscarriage, lower sperm count and hepatotoxicity in higher concentration (ATSDR, 1993). Cadmium concentration thus ranges from 0.60 -0.84mg/l, this result from industries releasing relative large amounts of Cd in agriculture applications. Several compounds of Cd are used in chemical industries and in manufacture of pesticides, herbicides, dyes and pigment and in agriculture which may be applied on the farm land. W.H.O (2006) permissible limits of Cd is 0.00002mg/l. Excessive consumption of Cd will result to diarrhea, stomach pains, bone fracture, damage to the central nervous system and immune system. Spills from hazardous waste sites and improper waste disposal can cause cadmium leakage in nearby habitats.(Jarup L, 1998). Chromium concentration ranges from 0.2 -0.60mg/l. This occurs as a result of industries releasing relatively large amount of Cr into the water due to the availability of chromium salt as the major tanning agent. Other environmental sources of Cr are emission of chromium based automotive catalytic converter. W.H.O(2006) permissible limits of Cr is 0.05mg/l. Consumption of Cr above W.H.O limits result to skin rash, nose irritations, bleeds, stomach upset, kidney and liver damage, lungs cancer (ATSDR, 2000).

Arsenic concentration ranges from 1.60 -10.20mg/l.This can be attributed from the use of arsenic pesticides and waste site present along the irrigation farm. Arsenic in soil results from human activities including pesticide, herbicide use in agriculture and e- waste disposal. W.H.O(2006) permissible limit of arsenic is 0.05mg/l. Excessive intake of arsenic result to irritation of stomach and intestine with symptoms such as stomach ache, nausea, vomiting and diarrhea.(Tchounwou *etal*.,2003).

Several compounds of cadmium are used in chemical industries in the manufacture of pesticides, herbicides used in agriculture (Alloway *et al* ., 1998).Farmers in kwakwachi took advantage of the continuous flow of water at their vicinity and unaware of the quality and the implications of using contaminated water for crops cultivation. This waste water contains large amount of organic materials, some inorganic elements and/or substantial amount of toxic heavy metals

(Zavadil, 2009;Arora*et al*.,2008; Lone *et al*., 2003).Non essential heavy metals which when present in large amount could be transferred to animals and human being through food chain (Lone *et al*., 2003).

V. CONCLUSION

The concentration of heavy metals in five selected medicinal plants (neem, bitter leaf, cashew, orange, lemon) around Kwakwachi irrigation farm was successfully determined using Atomic Absorption Spectrophotometer (A.A.S) which revealed the concentration of these metals 1.6-10.2 mg/l, 1.84-5.12 mg/l, 0.6-0.84 mg/l, 0.24-0.6 mg/l respectively in the sequence As>Pb>Cd>Cr. However the concentrations of these metals have exceeded W.H.O (2006) permissible limits. Hence urgent and proactive measures should be taken by government and other environmental protection agencies to curtail this menace.

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