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Determination of Trace Element in Raw Leafy Vegetables Grown in Selected Local Government of Osun State

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Abstract The trace metal contents of some green leafy vegetables in some selected local government area in osun state, was determined using standard methods and procedures. The trace metal composition are lead (Pb) which had a range between 0.1 and 0.9, zinc (Zn) was between 1.68 and 33.50, manganese (Mn) was between 0.33 and 8.32, copper (Cu) ranged between 0.22 and 5 .38 while the value of Nickel (Ni) was between 0.01 and 1.39. The results are expressed in ppm concentration unit. In conclusion, trace elements are present in some vegetables in the three selected local government.

Keywords Green leaf vegetable, Trace metal

1. Introduction

Vegetables are seen by many as a cheap way to increase the quality or foods while their dietary potentials are fully appreciated[6].

Plants bioactive research institute has a research program studying medicinal plants and vegetable extracts and isolated compounds and cancer preventive offer the most rapid and lowest cost method of producing adequate supplied of vitamins minerals and the tropical people in these areas. Vegetables used are understood to mean the leafy out growth of plant used as food which include those part of plants used in making "soup" and served as an integral part of the main course of the meal[2, 19].

Leafy vegetables are very perishable food items and required special treatment and storage to prevent loses. These commodities easily deteriorates in most homes in Nigeria, at best they are refrigerated where facilities are available for low temperature storage. The out standing preservative methods practice in many homes in Nigeria are fermentation and sun drying of vegetables.

These preservative methods have a considerable effect on the nutritive value of the final product[1].

Vegetables can be classified based on the part that is used as food. Leafy vegetables are those that are grown from the leaves or stem e. g Amaranthus, Cabbage and Lettuce.

Vegetables contain different elements. The other elements are those chemical elements other than carbon, Hydrogen, and Nitrogen which are required by the body. They are present in food mostly in the form of inorganic compound e.g. Sulphur and phosphorus are constituents of many protein. Vegetable are the major sources of minerals in the diets minerals. The minerals content of some green leafy vegetables commonly found in western part of Nigeria[2]. The above table list mineral elements required by the body. These minerals can work together in the body. Minerals have three main functions in the body which include[13, 15].

Effectiveness of enzymes in the body, they also serves as a constituents of borne and teeth. Enzymes are also present salt which help to control the compositions of the body fluid[4, 17].

Trace metals are present ion the soil semi-urban, and rural areas. The trace metal concentration of Pb Zn Ni and Cu, in industrial and semi urban soil were statistically significant at 0.05 level over control rural areas and the concentrations are within the permissible limits of agricultural soil[14].

Lead concentration in vegetables have increase in recent decades owing to human activities. The lead content of edible parts of plants growing in uncontaminated areas generally range. From 0.05 to 3.0mg /g. In the present study, Pb concentration in rural area vegetables is in the range of 0.88 to 1.02mg/g in the four crops, whereas in industrial and semi –urban area, the Pb concentration in vegetable is in the range of 1.72 to 4.63mg/g. Average concentration is 3.55mg/g. This clearly shows that, the air or soil of urban area contribute to the Pb by various sources, the permissible limit of lead in vegetables for human consumption is 2.0-2,5mg/g of the dry weight[6].

Environmental pollution of Zn greatly influences the it's concentration of this metal in plant. In the ecosystems where Zn is an borne pollutant, the tops of plant are likely to contain more Zn in it. Moreover, plants grown in Zn concentrated soil accumulate a great proportion of the metal in roots[17]. The zinc concentration in vegetables grown in industrial and semi urban area are reported in the range of 19.93 to

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41.46-mg/g and rural areas is in the range of 12.99 to 20.01mg/g. In all the study the resultant decrease in light energy absorption is a function of the number of free ground state atoms[8].

The nickel concentration in vegetable and fruit is fruit reported in the range of 0.02 to 2.7 mg/g. The elevated concentration of nickel and copper in plant tissue reflect man made pollution.

The Nickel content in vegetables from the industrial and semi urban areas showed large variability between the different area[7].

Copper is essential trace element to plants and the amount of copper present in plants varies with the copper content of soil of which it is grown. The copper concentration of food stuffs report in the range of 1.75 to 9.26 mg/g.

Ingestion of large amount of manganese may result in elevated concentration of manganese in the livers, but there are no ill effects overall

2. Material and Methods

All the laboratory equipment's are of standard analytical grade. All samples of green leaf vegetable i.e Green Leaf (Amarantus oruentus) (Telfaria Occidentals) Local garden leaf (solanum Macrecaroo) and Long fluted (Cor-chorus Olitorius) were bought from three different local government,Boripe local Government (Ada Market), Ila Local Government (Ila-orangun Market) & Boluwaduro local government (Otan Market) in Osun State, NIgeria. The sample were collected in the morning, the sample were immediately transferred into the laboratory in a clean plastic bag. Each sample of the leaves was removed from the stalks, washed thoroughly with distilled water and left to drain at room temperature. The samples were later sun dried, and kept for further analysis. This was later oven dried at 110℃, ground to powder and kept in a desiccator for further analysis.

2.1. Method

The dried ground sample was weighed using weighing balance.

The weighed sample was transferred into a muffle furname where it was ashed at 550℃ for four hours. 15ml of 10% Hcl was added to dissolve the ashed sample.

The mixture was filtered into a 100ml volumetric flask and the solution was made up to mark with the acid solution. This solution was then analyzed for metal using atomic absorption spectrophotometer[10].

2.2. Moisture Content Determination

This was determined as the loss of weight due to evaporation from the sample at a temperature of 110℃.

2.3. Ash Content Determination

2 grams sample each of the powders were obtained from the vegetable e g, Amarantus cqudatus, Telferia occidentals, Solanum Macrecaroo and Corchorus distorius were weighed and poured into a properly labeled porcelain crucible to give a mass of W1 they were carefully burnt at low red heat initially and finally ashes in a Metter furnace 550℃.

2.4. Principle of Operation of Atomic Absorption Spectrophotometer

Atomic absorption spectroscopy is an analytical techniques used for qualitative analysis of element in trace amount. This instrument method is based on the fact that majority of free atoms in flame are in ground state A good quality monochromatic light (provide by the Hcl) of characteristics energy can there be used to excite these free atoms in the flame.

The resultant decrease in light energy (Absorption) is a function of the number of there ground state atoms[10].

3. Result and Discussion

3.1. Result

TABLE: trace metal contents of vegetables in selected local government areas around osun state.

Table 1. Result for Analysis of Trace Elements in Different Vegetables

Sample	Local Govt. Area	Pb	Zn	Mn	Cu	Ni
Solanum Marctecareo (Local Garden leaf)	Boluwaduro	ND	6.38	0.84	4.80	ND
Telfaria occidentalis (Fluted pumpkin)		ND	10.93	0.33	0.22	1.00
Corchorous olitorious (Long fluted)		ND	1.72	8.32	0.68	0.30
Amarantus oruentus (Green leaf)		ND	33.50	0.96	4.91	1.21
Solanum macctearoo (Local garden leaf)		ND	8.09	0.42	0.64	1.39
Telfaria occidentalis (Fluted pumpkin)		0.04	16.12	5.78	0.31	0.30
Tellferia occidentalis (Long fluted)		0.24	1.68	2.03	0.56	0.51
Amarantus oruentus Green leaf		ND	21.23	2.57	0.83	0.4
Solanum Marctecareo Local garden leaf		0.01	20.63	1.01	0.28	1.00
Telfaria occidentalis Fluted pumpkin (uwgu)	boripe	0.01	18.94	3.98	0.21	1.01
Amarantus oruentus Long fluted		0.48	1.70	4.08	1.62	0.32
Amarantus oruentus Green leaf (tete)		ND	32.36	4.01	5.38	0.71

ND-NOT DETECTED

3.2. Discussion

Table 1 indicates the trace metal content of the four vegetable in the three local government area. All the vegetable contained low level of manganess (0.96-8.32) ppm, copper (0.82-5.38) ppm, zinc (1.70-33.50) ppm, lead (0.01-0.09) ppm except nickel has (0.71-1.39) ppm. Among the trace elements, zinc was predominant between the vegetable, the highest value of 33.50ppm discovered in green leaf (tete) in boluwaduro local government may have been due to the fact that the plant has the ability to store or accumulate Zn than the other plants[9, 16, 19].

The fact that plant has the ability to store or accumulate Zn than the other plants. As for the higher amount of zinc in all the plant than the other metals it may have been due to the naturally higher occurrence of Zn than the other metals in our local government areas. The value obtained falls below WHO standard 40ppm which is tolerable uptake level for human consumption zinc promotes biochemical reaction in the body, it supports health immune system, wound healing[11, 13, 19].

However, above tolerance standard set by WHO in diets, it could result in anemia, neurological degeneration[2, 9, 10].

The manganese (mn) concentration in the four vegetable are ranged from (0.96- 8.32) ppm the result indicate that orchorus argenta (ewedu) in boluwaduro local government had the highest level of manganese. Manganese promote growth, skeletal normalities, glucose tolerance etc. however, above recommend dietary allowance (RDA). It could be result in impaired reproductive function, skeletal abnormal impaired glucose tolerance[3, 7, 11].

The concentration of copper (cu) in vegetable was observed to be (0.38-5.38) ppm respectively amaranthus oruetus (tete) 5.38ppm was found to contain copper more than the others vegetable. It is necessary for normal biological activities of amino- oxide and tryrosinase enzyme. A daily dietary intake of 0.02-0.03ppm of copper is recommend for human adult. Anhwange et al, 2009 continuous injection of copper may induce chronic poisoning in man[15, 16, 17].

The lead (pb) concentration levels in Amaranthus Oruentus (tete), telfaria occidentalis, corchorus Argenta, solanum Marctecarroo (were range from 0.01-0.009.

Similarly, corchorus Argenta (Ewedu) was found to contain high concentration of lead, this amount is far below the set threshold limit for safety by WHO. Above this limit could result in lead poisoning a disease condition which is characterized by blindness, deafness, hypertension[11, 14].

Nickel (Ni) the range of concentration between three local government are (0.71 – 1.39)ppm in Amaranihus Oruenthus (tete), Telfaria Occidentalis (ugwu) corchorus Argentenus (Ewendu), solanum martecarroo (igbagba Origbo). The concentration of nickel is higher in solanum marcetaro (igbagba) The concentration of nickel is higher in solanum marctecarro (igbagba) the amount of Nickel in all vegetable were above the oermissive level set by FAO and WHO (0.02)ppm for human consumption[5, 9, 13].

4. Conclusions and Recommendations

4.1. Conclusions

In conclusion, the vegetables analyzed contain various concentrations of metals, though the levels of accumulation is far below WHO tolerant limit for all metal except nickel which has higher level than the recommendation intake amount of 0.02ppm.

Meanwhile, continous eating of this sample under investigation may result into bioaccumulation of zinc which may pose a threat to human's life.

4.2. Recommendations

Nutritionist should be recommending dietary to pregnancy and breast feeding mothers for their exceptional need.

It is recommended that regular monitoring of vegetable should be done so as to reveal contamination before they could spread beyond limit.

There should be awareness for the masses on the taking vegetables, because, it helps the body system and improve the immune system.

There should be measured standard for farmer while applying the fertilizer to their vegetable.

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