Global Scientific JOURNALS

GSJ: Volume 10, Issue 3, March 2022, Online: ISSN 2320-9186

www.globalscientificjournal.com

Heavy metals analysis in foreign and local rice (*Oryza Sativa)* and its implications

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ABSTRACT

The study of some metals in foreign and local rice (oryza sativa) were studied using atomic absorption spectrophotometer (AAS) . the metals analyzed and the results obtained include the following; For local rice ; Lead (Pb) = 0.42mg/kg, Iron (Fe) = 242mg/kg, cyanide = 27.26 mg/kg For foreign rice lead (Pb) – 0.47mg/kg, Iron (Fe) = 243mg/kg and cyanide = 120mg/kg respectively, the cyanide contents were also studied and the results obtained showed that the local rice CN = 27.26mg/kg and the foreign rice CN = 120.01(mg/kg. The result reveals that the concentration of lead (Pb) in both local and foreign price is high when compared to World Health Organization (WHO) standard which is 0.30mg/kg while that of cyanide and iron (27.26/242) and 66.85/33.02 for local and foreign rice respectively. These values are within yhe permissible limits of World Health Organization (WHO). However, increase in the concentration of lead in both local and foreign rice can be as result of packaging, processing and other industrial activities associated in the production of rice. The health implications are minimal since the cyanide contents are within the limit.

Keyword. Atomic absorption spectrophotometer, cyanide, iron, oryza sativa etc

INTRODUCTION

The determination of heavy metal concentrations and content in Local and Foreign Rice (Oryza sativa) is important because of the public health implications. There are recommended standards for heavy metal concentrations in foods like rice, (WHO/FAO 200 1-1999; Cardoso et al., 2005; CIAT, 2007; Wheatley et al., 1993). Rice (*oryza sativa*) is a dietary staple food and one of the most important cereal crops, particularly in Nigeria (local rice). It provides the major need of daily calories for most animal and human (Ryan, 2011). Rice is one of the stable foods that provide basic nutritional balance for the body needs. Our concern is to access if it is safer for human consumption or not. High levels of heavy metal in rice are likely to induce a corresponding contamination in rice, accumulating these metals, can exert potential risk to humans. It is therefore necessary to compare the values gotten with that of World Health Organization (WHO) if the consumption of rice (local and foreign rice) is safer or not in Nigeria. In food processing, it is often necessary to carry out trace elements analysis to ensure that harmful and non- harmful, non-essential element are kept at low concentrations as much as possible. Most of these, ions which are toxic to human beings by interfering with enzyme functions while some may have stimulatory effects when the metals intake is at low concentration, the body system might not be able to remove it and it will remain in the body as impurities for a short time. The increase in cyanide, lead, iron and some metal toxicants in rice can cause toxic effects for consumers. The gravity of toxic effects depends on the nature, quality of chemical and body resistance and on synergetic or antagonistic effects of other chemical contaminations. Tavono. (2014).

As a cereal crop, which is one of the most featured types of food in the world. It spreads it tentacles to almost all the tribes' race and countries of the world. In this present time and since the inception of the world. There are different types of rice, and they are rated according to its colours. They include, white rice, which can be found in Gambia, Milk colour rice, which is the local rice. The imported rice in Nigeria is known as foreign rice. The local rice is blessed with so many nutritious values, which is got from the salinity in the land of local rice mill. It is even better, and graded higher by the learned, that knows the nutritional values to it. (Udosen et al, 2016).

Materials and METHODS

Cyanogenic potentials of the test samples were determined by a modified version of the alkaline Picrate impregnated filter paper strips method by Nwokoro et al. (2010).

- The method involves the preparation of varying concentrations (1 to 10 PPM) of standard KCN solution from a stock solution of KCN (0.2 g %).
- The KCN solutions in glass bottles were subsequently acidified with 20% HC1 acid solution in ratio 1:1 to release the free cyanide as HCN and immediately sealed with 3 Picrate impregnated filter paper strips.
- The set-up was maintained at 80°C in a water bath for 10min and was subsequently removed from bath and kept on the laboratory at room temperature for 24h.
- The red coloured Picrate paper strips from each glass bottle were removed and rinsed in 5 ml 50% ethanol solution and kept for 30 mm.
- Thereafter, the absorbance of the solution was measured using a spectrophotometer at 510 nm wavelength against a similarly prepared blank developed without KCN solution.
- A standard calibration curve of absorbance against cyanide concentration in PPM HCN equivalent was plotted.
- The plot was subsequently used for evaluation of cyanide concentration in the test samples.

PREPARATION OF TEST SAMPLES FOR ANALYSIS OF FREE CYANIDE (AS HCN EQUIVALENT)

- 10 g of each sample was mixed with 50 ml of water in a corked conical flask
- Allowed to stand for 24 h to extract the residual cyanogenic glucosides in the samples.
- The mixture was subsequently filtered to obtain the soluble extract containing cyanoglucosides.
- The same procedure as with standard KCN solutions was followed to determine the free cyanide concentration (as HCN equivalent) in the sample filtrate.
- The absorbance of the sample solution was equally measured at 510 nm wavelength against a blank devoid of KCN solution.

Cyanide levels of the test samples were evaluated from the standard calibration curve by extrapolation.

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RESULT AND DISCUSSION

DATA PRESENTATION AND ANALYSIS

The result obtained from the study are presented below and analyzed accordingly.

Table1.0: Cyanide Content and Concentrations of three Heavy Metals in Local and Foreign Rice (Oryza saliva)

Heavy metals	Rice (oryza sativa) (mg/kg) concentration		WHO/FAO (2001-1999) (Cardoso et al., 2005; CIAT, 2007), (Wheatley et al., 1993)
	Local Rice	Foreign Rice	
Lead, Pb	0.42(mg/kg)	0.47(mg/kg)	0.30mg/kg
Iron, Fe	242(mg/kg)	243(mg/kg)	425mg/kg
Cyanide	27.26(mg/kg)	120.01(mg/kg)	1-12000mg/kg

Table 2.0 : Percentage Composition of Three Heavy Metals and Cyanide Content in Local and Foreign Rice (Oryza saliva).

Heavy metals	Percentage Composition of Cyanid and Heavy Metals in Rice			
	Local Rice (mg/kg)	Percentage (%)	Foreign Rice (mg/kg)	Percentage (%)
Lead, Pb	0.42	0.16	0.47	0.13
Iron, Fe	242	89.74	243	66.85
Cyanide, Cd	27.268	10.11	120.01	33.02
Total	**269.68**	**100**	**363.48**	**100**

The determination of heavy metal concentrations and content in Local and Foreign Rice (Oiyza sativa) is important because of the public health implications. There are recommended standards for heavy metal concentrations in foods like rice, (WHO/FAO 200 1-1999; Cardoso et at., 2005; CIAT, 2007; Wheatley et al., 1993). The results of Lead (Pb) in the Rice sample from mass spectroscopy determination showed a concentration of 0.42 and 0.47mg/kg for the Local and Foreign Rice respectively. The value is above the WHO recommended limits of 0.30mg/kg. The concentrations of Iron (Fe) in the Rice samples were found to be 242 and 243mg/kg for both the Local and Foreign Rice samples, this is slightly below the WHO recommended standard of 425mg/kg. The results of Cyanide determination indicated a value of 27.26 and 120.01mg/kg for u both the rice samples as seen in Table I which is within the WHO recommended limits Of 1- 1 200mg/kg.

In table 2, the results obtained indicated a higher percentage of Iron (89.72) among the other heavy metals that were determined.

DISCUSSION OF RESULT

The presence of heavy metals as trace metals are components of Human Living System although Result reveals that the quantity of lead (Pb) in both local and foreign price is high when compared to World Health Organization (WHO) standard as shown in table 2 while that of cyanide and iron (27.26/242) and 66.85/33.02 for local and foreign rice respectively. These values are lower for both local and foreign rice when compared

to World Health Organization (WHO) standards indicating that both rice are fit for human consumption

Heavy metals are highly toxic when present in these systems in high concentration and when they accumulate above maximum leve ls in any physiological system; they tend to be highly injurious to health.

CONCLUSION

From the research carried out, the results showed that the heavy metal found in local and foreign rice have a potential risk to human health. Based on the data obtained from the local and foreign rice, lead concentration is above the world health organization (WHO) which is not helpful to human and can cause neurotoxin that accumulates both in tissues and muscles . While in iron the concentration level of the both rice local and foreign is below the (WHO) shows that iron are pr The result of cyanide determination indicate that the both rice samples as seen in table I which is within the WHO recommended limits of 1- 1200mg/kg is safer.

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