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Determination of Heavy Metals in Palmwine from Nsude in Udi Local Government Area, Enugu State, Nigeria.

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ABSTRACT

The levels of some heavy metals such as cadmium (Cd), lead (pb), Nickels (Ni), Iron (fe) manganese (Mn) in palm wine from Nsude in Udi local government area of Enugu state have been determined using Atomic absorption spectrophotometer (AAS). Fresh samples of palm wine were collected from Nsude in Udi local government area of Enugu state and was taken straight for analysis. The palmwine was digested using concentrated hydro chloric acid (HCL), Nitric acid (HNO₃) and H₂SO₄ and it was heated until a clear digestion was obtained and digested sample was diluted with distilled water to 100ml mark. It was kept in the refrigerator to cool. A stock standard solution containing 100ml in 2% HNO₃ of the metal (Pb, Cd, Fe, Ni, Mn) was prepared. A calibration blank was prepared using all the reagents except for the metal stock solutions. Calibration curve was prepared by plotting the absorbance of standard versus their concentration and the results obtained were as follows; Cd-0.000373, Ni-0.000799, Mn- 0.001062, Pb-0.000647, Fe-0.000934, Comparism of these heavy metals in the palm wine with those of international/National standard of heavy metals for food, vegetables, cereals and vegetables shows that all the metals are within allowable limit.

Keywords: Heavy metal, palwine, Nsude, Nigeria.

INTRODUCTION

Palm wine is the fermented palm sap obtained by tapping of palms (family palmea). Two sources of palm wine in Nigeria are the fermented sap of oil palm tree (*Elaeis guineensis*) and the Raphia palm tree (*Raphia hookeri*, MANN AND WENDL). Raphia palms inhabit in swampy regions or areas of wet soil, *E. guineensis* otherwise known as oil palm is the species of *elaesis* found in Nigeria. It is widely distributed in West Africa. Methods of tapping include, tapping at the base of male flower bud (in inflorescence tapping) or at the base of the terminal bud (in stem tapping) [1]; [2] intensive tapping often results in termination of growth and death of palm trees. In other

parts of the world, like Philippians, Tunisia Algeria and Libya, equivalents of palm wine are produced by palm trees [3] In Nigeria, palm wine have been associated with peasant life because it is cheaper and produced in the rural areas. [4] However as the cost of brewed alcoholic beverages rises, the trend is changing and demand for palm wine has risen among urban dwellers. The palm wine unduly is of considerable economic and nutritional importance in West Africa, palm wine is fast becoming an important source of revenue for the rural poor, but has received very little scientific attention.

STATEMENT OF PROBLEM

The gradual health problems attributed from intake of heavy metals have contributed to environmental disease.

This have been a global problems due to the quality of food and liquids consumed. This metal pollution by heavy metals ocher domestic agricultural waste and industrial production and those from

burning of fossil fuels through Automobiles and gas flowing in oil producing areas.

This metal pollution in palmwine and other food has prompted this research work some millions of African are used to consuming reliant grown from various areas.

OBJECTIVE OF THE STUDY

General objective

To determine the concentration of some heavy metals in commercially sold palmwine in Nsude town Udi local government area of Enugu State,

Specific Objectives

To determine the level of heavy metals in palm wine sold in Nsude town Udi local government area of Enugu State.

To find out if there is any difference in the concentration between the test carried out and the world health organization (WHO) standard for heavy metals,

Significance of the study

1. The results obtained from the research work will help to guide the consumers on how to monitor their health.

2. The information gathered from the work will also help to carry out a research on the soil of various towns were these palm wines are being tapped.

Scope and Limitations of the Study

Due to financial constraints and time, the study is limited to only Nsude town in Udi local government of Enugu State, of which we would have love to carry out the research on Every part of the Town.

RESEARCH METHODOLOGY

A Sampling

Fresh sample of palm wine was collected from Nsude in Udi Local government area of Enugu state at 9: am on Wednesday 26th October 2016 and was taken straight to spring board Laboratories Awka for Analysis.

B) Reagents and Chemicals.

650ml of cone HNO_3 ; 80ml HCL acid and 20ml of cone H_2SO_4 was used for digestion of sample,

C) Digestion of palm wine sample [5] 2g of the sample was weigh out into a digestion flask and 20ml of the acid mixture (650ml cone HNO_3 ; 80ml hydrochloric acid; 20ml of cone H_2SO_4 and it was heated until a clear digest is obtained.

2) The digest was diluted with distilled water to loom mark.

3) A refrigerator was used to keep the palm wine cool until the Analysis, 250ml round bottomed flask with reflex condenser was used to keep the palm wine in the refrigerator for cooling.

4) A stock standard solution containing 100mg/l in 2% HNO_3 of the Metal (Pb, Ni,

Cd, Mn, Fe) was prepared A calibration blank was prepared using all the reagents except for the metal stock solutions. Calibration curve was prepared by plotting the Absorbance of standard versus their concentration [6].

Methods for the Heavy Metal Analysis

Heavy metal analysis was conducted using AA240 Atomic Absorption spectrophotometer according to the method of APHA 1995 (American public health Association). Working principle: Atomic Absorption spectrophotometer's working principle is based on the sample being aspirated into the flame and atomised when the AAS light beam is directed through the flame into monochromatic light absorbed wavelength, a source Lamp composed of that element is used (hollow cathode lamp), making the method relatively free from spectral interferences. The Amount of energy of the characteristic wave length absorbed in the flame is proportional to the concentration of the element in the sample.

RESULTS AND DISCUSSION

Table 1: Shows the concentration of the heavy metals Cd, Pb, Ni, Mn, Fe in palm wine sample collected from Nsude in Udi Local Government Areas of Enugu State

Parameter analysed	Concentration the sample	in WHO/NIS Guide lines	
		WHO	NIS
Nickel (Ni)	0.000799 ppm	<0.02 ppm	0.02 ppm
Manganese (Mn)	0.001062 ppm	0.5 ppm	0.5 ppm
Cadmium (Cd)	0.000373 ppm	0.003 ppm	0.003 ppm
Lead (Pb)	0.000647 ppm	0.1 ppm	0.1 ppm
Iron (Fe)	0.000934 ppm	0.3 ppm	0.3 ppm

DISCUSSION

The increasing global pollution of the environment requires a systematic monitoring of all kinds of food including wines. Daily consumption in a moderate quantity contributes significantly to the requirements of human for essential elements but for heavy metals in high exposure is really risky.

Iron (Fe)

The metal concentration of iron from the analysis was found to be (0.000934 ppm) of the palm wine collected in Nsude, Udi local Government area shows that, iron falls within permissible limit by the world health organisation, which is 0.3 ppm. (WHO 1993) and (NIS 2013).

Manganese (Mn)

Manganese is one of the important essential element required in (carbohydrate metabolism as well as an antioxidant in super oxide dismutase enzymes, it is required in little quantity and deficiency rarely occur. Manganese toxicity is reported in liver diseases- The reported intake limit of manganese is 0.1 ppm from the result of the analysis manganese is (0.001062 ppm) and its within the permissible limit approved by the World Health Organisation And The National Industrial Standard and there is no risk of toxicity (WHO 1993) and (NIS 2013).

Lead (Pb)

Lead is a highly toxic metal to man since it causes brain damage particular to young people and it induces aggressive behaviour. The major ways of toxicity by lead to man is caused through respiration/inhalation. From the result of the analysis the value of lead concentration is (0.000647) and the result

falls within the permissible limit approved by World Health Organisation And National Industrial Standard which is 0.1 ppm, therefore there is risk of contamination (WHO 1993) and (NIS 2013).

Nickel (Ni)

According to McKenzie and symthe, more attention has been given to its toxicity in low concentration, this is because nickel can cause allergic reactions and nickel compounds are carcinogenic. Nickel plays its role as a coenzyme in different enzymes. Lower content of nickel can lead to increase in blood sugar level, hypertension and deficit of growth in human but on the hand the increase intake of nickel in drinks can reduce the blood glucose level difficulty in breathing and nausea. From the analysis of the palmwine collected in Nsude Udi Local Government nickel gave a concentration of (0.000799) and the permissible limit approved by world health and national industrial standard is 0.2 ppm permissible limits which means it poses no risk of toxicity, (WHO 1993) and (NIS 2013).

Cadmium (Cd)

Cadmium is the seventh most toxic heavy metals as per Agency for substance and disease registry (ATSDR) ranking. It is a byproduct of Zinc production which human or animals may get exposed to at work or in the environment. Once this metal gets absorbed by humans. It will accumulate inside the body throughout life, From the result cadmium is (0.000373) which means it is still under the permissible limit approved by World Health Organisation And National Industrial Standard is 0.003 ppm, Which

means there is no risk of contamination.(WHO 1993) and (NIS 2013).

All the metals investigated in this study were within the permissible limit approved by the World Health Organisation (WHO), However this posses

no trait of these heavy metals under investigation, but excessive intake must be avoided to prevent the bio accumulation of these harmful metals in the body which might result in severe complications.

CONCLUSION

The results of the analysis for the metals under investigation gave concentrations much lower than the international/national standards for food, vegetables, cereals and drinking water established permissible limits, In conclusion, it showed that the palm wine tapped at Nsude in Udi local government area of Enugu state has no risk of

contamination and therefore people should continue to consume it. However, more research work is needed to cover more areas and because of time and financial constraints, we decided to use one particular sample which is not a good representative of that particular town (Nsude).

RECOMMENDATION

From the analysis carried we recommend the following:

1. That the palm wine from Nsude town is free of heavy metal contamination and therefore it is good for consumption.

2. We also recommend that more work should be carried out on the area which will cover lager areas with multiple samples so that a more reliable result can be obtained.

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