Scholarly Journal of Agricultural Science Vol. 10(2), pp. 43-47 July, 2020
Available online at http:// www.scholarly-journals.com/SJAS
ISSN 2276-7118 © 2020 Scholarly-Journals

Full Length Research Paper

Effect of ash produced from different agricultural residue as an alternative for natron on human health

Ojo Celestina Adebimpe

Department of Food Technology and Human Nutrition, University of Agriculture Krakow, Poland
Email: bimpe4luv007@gmail.com.

Accepted 28 July, 2020

Natron is used for the preparations of certain food and it stays in the body. The study as carried out to consider the health impact of ash produced from agricultural residues (palm bunch ash, sesame stem ash, and parkia wood ash) with the aim to consider their suitability as alternative to natron consumption. The study was carried out in the histology Laboratory School of Veterinary University of Ibadan. Mele Wistar albino rats weighing between 100-140kg body weights purchased from Central Animal Laboratory, Physiology Department of the University of Ibadan, Nigeria. The animals were kept in plastic cages with wire cover in the paddock. The experiment was laid out in a Complete Randomize Block Design (RCBD) with five treatments replicated four times. The rats were fed with feed and water and weight once a week for a period of four weeks. After four weeks, the animals were anaesthetized with chloroform vapour. Blood samples were collected through cardiac puncture into labelled tubes for electrolyte analyses and allowed to stand for 30 minutes to clot and centrifuged at 4000 g for 10mm and the serum obtained was pipette into labelled tubes. The data collected was subjected to mean and analysis if variance (ANOVA). The result of proximate composition of different source of the food additives shows that Crude protein ranges from 0.03%, to 0.05% to 0.07%, and 0.09% for natron, palm bunch ash, sesame stem ash, and parkia wood ash respectively. The fat and fiber content was 0.00 for all the food additives, the ash content in the food additives suggested good mineral preservation capacity. Owing the various changes in the histology test assessed, Parkia wood ash and Natron are toxic to the kidney and liver and can induce damages. Palm bunch ash shows a better performance while sesame stem ash shows the best health performance.

Key words: Natron**,** Fat and fiber, Agricultural residues and Ash

INTRODUCTION

Natron mineral resources which are highly beneficial for human usage have been unravelled in the past and more are yet to be known. Natron, also known as edible potash, “kaun”, “akanwu” or “kanwa”. Potash is a type of lake salt (sodium bicarbonate) that is dry and hydrated in nature. Usually forms and shoots out from the soil during rainy season but tends to fall off, solidify and dry up during the dry season. Natron is usually covered by shallow water by approximately less than 2ft deep (Ekanem et. al, 1992). Natron salt is the second most popularly used salt in Nigeria. However, it has been reported that natron has a very low quantity of potassium compare to sodium. Chad Natron is a naturally occurring mixture of sodium carbonate deca hydrate ($Na_2CO_3 \cdot 10H_2O$, a kind of soda ash) about 17% sodium bicarbonate (also called baking soda, $NaHCO_3$) along with small quantities of sodium chloride and sodium sulfate . Natron is white to colourless when pure, varying to gray or yellow with impurities. Natron deposits are sometimes found in saline lake beds which arose in arid environments.

From prehistoric times to recent time, natron has had many practical applications. In modern mineralogy, the term natron has come to mean only the sodium carbonate decahydrate (hydrated soda ash) which makes up most of the historical salt. Natron is edible and is usually used for cooking pulses like beans, akidi (black Mexican beans), fiofio (cowpea beans) in order to tenderize the pulses so easily. Natron is also added in ewedu and okro soup during preparations in order to boost the viscosity as well as to increase the greenness and texture of the vegetables. It is used for mixing water

and oil while preparing local dishes like abacha, ugba and nkwobi.

Although Natron is used for the preparations of certain food however, previous studies has revealed that it is not suitable for human health because of its high leave of sodium and potassium which is associated some heart diseases, thus curtailing it consumption is highly advisable because natron cannot be digested by the human body, so, when it is ingested, it just stays in the body and this can cause health problems like hypertension. (George et. al, 2006). Soladoye and Oyeleke (1990) reported that natron can be used to increase uterine contractility and this has been suspected to have the ability to induce abortions in the early stages of pregnancy if used at high concentration. World Health Organization reported that natron was implicated in the incidence of peripartum cardiac failure (PPCF) (a type of heart failure that occurs during the last months of pregnancy or within few months after delivery) among nursing mothers. In the Northern region of Nigeria, there exist a cultural practice where by mothers are given kunu akawan (a cereal drink with a lot of natron added to it) given to pregnant and just delivered mothers so as to clean all clotted blood in their womb. However, some northern part of this country uses sesame ash, Palm fruit bunch ashes (ngu), ashes of roasted peels of unripe plantain and baking soda has been seen to be better alternative to natron.(Global Food Book, 2015)

Plant residues mostly in Nigeria has been seen as waste after harvest, some of such is the sesame straw, oil palm bunch and wood. Nevertheless, there is potential for sesame straw, oil palm bunch and wood when burnt, they sever as alternative for natron. Literatures have shown that natron has some dangerous side effects such as high blood pressure, inflammation of the lungs, eyes and skin. However little is known about some alternatives for natron. This therefore gives raise to the need to explore alternative and cost effective, safe and assessable replacement for natron due to its negative effects on human. Therefore, the study was carried out to determine the effect of alternative food additives as a replacement for natron (kanwa) with the view to determine the mineral composition of various sources of ash from plant origin as natron and analyse their effect as replacement for natron in human consumption.

MATERIALS AND METHODS

Materials

The materials used in this experiment includes; Laboratory rats, natron powder, sesame stem ash, palm fruit bunch ash, parkia wood ash, rat feeds, paranoid capillary tube, EDTA bottle recording sheet, formalin, micro-centigrade, micro-scope, wax, knife, dye, sheet, rule and biro, universal bottle spinner, pastune pipette. Chemicals, instrument, apparatus and reagents used for this work were analytically graded and purchased from reputable chemical laboratories.

Experimental Animal

Wistar albino rats of the same sex (male) weighing 100-140 kg body weights were used for this study (Plate 1). The animals were purchased from Central Animal Laboratory, Physiology Department of the University of Ibadan, Nigeria. The animals were kept in plastic cages with wire cover in the paddock (Plate 2). They were divided into 5 groups and allowed 2 weeks to acclimatize before the commencement of the experiment. The rats were fed with pelletized growers' feed (Vital feed) and were allowed access to water. They were treated according to the rules and regulations of animal ethics and weight of the rats were taken once a week for a period of four weeks.

Collection and Preparation of the Feeds and Food Additives

Sesame ash was gotten from harvested sesame stem from farm within Lafia, Nasarawa State and burnt into ash after which the ash was filtered and dried, same goes for the palm fruit bunch ash and wood ash. The wood ash was gotten by burning *Parkia biglobosa* wood. Natron (edible potash) was bought at Ogunpa market Ibadan Oyo State. The rat's feeds were purchased at the University of Ibadan second gate Ojoor road Ibadan. The food additives were then weighed and stored in a stoppage container at room temperature until used. The food additives used in feeding the rats was subjected to proximate analysis at Institute of Agricultural Research and Training (MOOR Plantation) Obafemi Awolowo University Ibadan. The feed which was in powdery form was weighed into 12kg each and 500g of each treatment samples and pelletized with pelletizing machine. The pelletized feeds were sun dried for three days to increase its shelf life. The rats were fed with 25kg of feeds for 12 days after which they were fed with the pelletized feed for four weeks. The treatment combination is shown on Table 1.

ANIMAL STUDIES (BIOASSAY)

Blood Sample Collection, Preparation of Serum

The animals were not fed a night before their blood samples were collected; they were anaesthetized with chloroform vapour. Blood samples were collected through cardiac puncture into labelled tubes for electrolyte analyses (Plate 3). The labelled centrifuge tubes were allowed to stand for 30 minutes to clot and centrifuged at 4000 g for 10mm and the serum obtained was pipette

Table 1: showing the experimental layout of Treatment combination

Samples	Treatment combination
A	12kg of fed with feed mixed with 500g of natron powder
B	rats fed with feed mixed with wood ash
C	rats fed with feed mixed with sesame ash
D	rats fed with feed mixed with palm fruit bunch ash
E	rats fed with feed mixed with nothing as the control

Plate 1: Animals during weighing | **Plate 2:** Animals in their cages in animal house | **Plate 3:** Collection of the blood serum | **Plate 4:** Blood samples in test-tube

Plate 1, 2, 3 and 4: Cardiac puncture into labelled tubes for electrolyte

Table 2: Proximate and mineral composition of different source of the food additives.

Sample description	% crude protein	% fat ether extract	% total fiber	z	% Mg	% Ca	% P	% Na	% K
Natron	0.03	0.00	0.00	88.67	9.53	26.75	13.81	3.89	7.86
Sesame stem ash	0.09	0.00	0.00	89.67	9.69	21.92	13.06	3.11	5.21
Oil palm bunch ash	0.05	0.00	0.00	88.94	9.85	20.67	12.59	3.18	4.79
Pakia wood ash	0.07	0.00	0.00	89.83	9.72	23.89	13.75	3.18	4.95

into labelled tubes.

ANALYSIS OF DATA

The experiment was laid out in a Complete Randomize Block Design (RCBD) with five treatments replicated four times. The data collected was subjected to mean and analysis if variance (ANOVA).

RESULTS AND DISCUSIONS

Results of proximate analysis of samples

Proximate composition of different source of the food additives was shown in (Table 2) Crude protein ranges from 0.03%, to 0.05% to 0.07%, and 0.09% for natron, palm bunch ash, sesame stem ash, and parkia wood ash respectively. This observation is similar to the reports of Ijeh *et al.,* 2010 for palm bunch ash. The fat and fiber content is 0.00 for all the food additives indicates that fat and fiber are not present in the food additives. The ash content in the food additives was associated with the amount of mineral present (Egbuonu *et al.,* 2013), the ash content in the food additives suggested good mineral preservation capacity. The vital function of mineral is important for normal metabolism in the human system, among the elements investigated are magnesium (9.53% in natron, 9.69% in sesame stem ash, 9.72% in parkia ash and 9.85% in oil palm bunch), sodium (3.11% in sesame stem ash, 3.18% in both oil palm bunch ash and parkia tree ash, 3.89% in natron) and phosphorus (12.59% in oil palm bunch ash, 13.06% in sesame stem

Table 3: Mean weight gain of the laboratory rats fed with the different sources of food additives

Treatment	Initial weight	Week 2	Week 3	Week 4
Natron	23.8	32	39.2	35.66
Parkia wood ash	3.12	7.39	8.96	5.04
Sesame stem ash	9.39	16.1	12.67	16.69
Palm ash	12.40	16.21	20.26	21.8
Control	4.46	8.26	9.86	14.46
Mean	10.63	15.99	18.19	18.74
Significant	0.00***	0.03	0.00	0.05
Set	1.679	.993	1.750	2.056
LSD	5.131	3.176	5.516	6.478
Cv %	8.0	35.0	17.3	25.1

Table 4: Sodium and bicarbonate concentration in blood samples of Albino rats.

Treatment	Sodium (Na) mmol/L	Bicarbonate(HCO_3) mmol/L
Natron	203.0	72.8
Parkia tree ash	260.0	95.4
Sesame stem ash	228.0	74.2
Palm ash	209.0	70.7
Control	211.0	67.9
Mean	222.0	76.2
Significant	0.59	0.001***
Set	27.2	2.91
LSD	88.8	9.48
% Cv	16.9	3.6

ash, 13.75% in parkia tree ash and 13. 81%natron) are found present in lower levels. Generally, calcium and potassium are required for cellular functions with recommended allowance for adolescents and adults up to 1300mg daily (calcium) and (phosphorus) (FAO/WHO, 2001). For instance, Calcium deficiencies result in the developments of type1 and type11 diabetes (Pittas *et al*., 2007). Calcium content in the materials ranges from 20.67% in oil palm bunch ash, 21.92% in sesame stem ash, 23.89% in parkia tree ash, and natron has the highest with 26.75% and potassium content ranges from 4.79% in oil palm bunch ash, 4.95% in parkia tree ash, 5.21% in sesame stem ash and 7.86% in natron. This suggested that these food additives may improve the calcium and potassium content if added to food.

Result of body weight of albino rat

Table 3 show the body weight of the albino rats, the table shows that there is no significant (p>0.05) change in the treated animals when subjected ANOVA. This also is in agreement with the report of Sabiu *et al*., (2014) that there is no significant (p>0.05) change in the treated animals when compared with the control. Unlike the report of Soladoye and Oyeleke (1990) that states that in this study it was observed that the mean weight of both test groups and control increased before the administration of the substance, this observation as was not statistically significant (P>0.05). Similarly, there was significant reduction (P<0.05) in the body weight following the administration of potash.

Concentration of sodium and bicarbonate in blood samples of albino rats

Table 4 showed the concentration of sodium and bicarbonate (mmol/L) in blood samples of albino rats. The sodium concentration in blood samples ranges from 203mmol/L in natron to 209mmol/L in oil palm bunch ash to 211mmol/L in control samples, to 228mmol/L in sesame ash and 260mmol/L in parkia wood ash. The bicarbonate concentration ranges from 67.9mmol/L in the control, 70.7mmol/L in oil palm bunch ash, 72.8mmol/L in natron, 74.2mmol/L in sesame stem ash and 95.4mmol/L in parkia tree ash. The result indicated that there is no significant variation (p>0.05) in the levels of sodium content in the blood of treated animals but there is significant different (p>0.05) in the levels of bicarbonate content in the blood of treated animals. In this study, it was obsevered that there was an increase in the level of serum bicarbonate when compared with control group especially in the group fed with parkia wood ash. This increase was statistically significant (p>0.05). This observation was in agreement with the report of Dioka et.al (2004), Boogaard *et al*., (2005) and Hernardez *et al*., (2006) on the nephrotoxicity effect of some certain mixture of hydrocarbon, bicarbonate, gasoline vapors, lead, insects and pesticide in human and experimental

animals.

CONCLUSION

This study revealed that parkia wood ash may contain chemical substances that are toxic affecting kidney and liver. The specific chemical constituents and mechanisms responsible for the effect of toxicity reported in this study to be associated with wood ash are not very clear. However, it may be assumed that reactive metabolites of wood ash constitutes could have interact with the kidney and liver tissues to cause damages in the glomerular functions and also cause dilation sinusoids in the liver cells. Furthermore, the significant increase in the concentration of serum bicarbonate reported in this study might have resulted from the body of the rat having problem maintaining its acid base balance by failing to remove carbon dioxide through the kidney which might leads to kidney disease, shock, Diabetic ketoacidosis or metabolic acidosis. Finally, wood ash may cause various deleterious distortions which occur in the kidney and liver, it is therefore necessary to stop the intake of wood ash.

REFERENCES

Boogaard, P.J., Rocchi, P.S.J. and Sittert, N.J.V. (2005): Effect of Exposure to Low Concentrations of Fluorinated Hydrocarbons on the Kidney and Liver of Industrial Workers. *British J. Ind. Med.,* 50: 331-339.

Dioka, C.E., Orisakwe, O.E., Adeniyi, F.A and Meludu, S.C. (2004): Liver and Renal Function In Artisans Occupationally Exposed To Lead In Mechanic Village in Nnewi, Nigeria. *Int. J. Environ. Resources and Public Health*, 1: 21-25.

Egbuonu, A.C.C. and Ezeanyika, L.U.S. (2013). L-arginine exposure improves renal function markers of metabolic syndrome in female rats. Am. J. Biochem. Mol. Biol., 3: 50-60.

Ekanem E.J and Harrison G.F.S. (1992). "The raw material potential of lake salt (kanwa). A poser for Nigeria Industries". Paper presented at the 3rd Annual Conference of Science Association of Nigeria. Makurdi.1992

FAO/WHO, 2001. Human vitamin and mineral requirements: Report of a joint FAO/WHO expert consultation Bangkok, Thailand. World Health Organization/Food and Agriculture Organization of the United Nations, Rome, Italy, pp: 161-162.

Global Food Book. All Rights Reserved 2015. Terms of Use | Privacy Policy

Hernandez-Serrato, M.I., Fortoul, T.I., Rojas-Martinez, R., Mendoza-Alvarado, L.R. and Canales-Trevino (2006): Lead Blood Concentrations and Renal Function Evaluation: Study in an Exposed Mexican Population. *J. Environ. Resources*. 100: 227-233.

Ijeh, I., Ejike, C.E.C.C., Nkwonta, O.M. and Njoku, B.C. (2010). Effect of traditional processing techniques on the nutritional and phytochemical composition of African bread-fruit (*Treculia africana*) Seeds. J. Applied Sci. Environ. Manage. 14: 169-173.

Pittas, A.G., Lau, J. Hu, F.B. and Dawson-Hughes, B. (2007). The role of vitamin D and calcium in type 2 diabetes. A systematic review and meta-analysis. J. Clin. Endocrinol Metab.92: 2017-2029.

Sabiu, S., Wudil, A.M. and Sunmonu, T.O. (2014). Combined administration of *Telfaira occidentalis* and Vernonia amygdalina leaf powders ameliorates Garlic-induced hepatotoxicity in Wistar rats. Pharmacologia. 5(5):191-198

Soladoye, A.O. and Oyeleke, O.A. (1990). "The effect of moderate intake of natron (kanwa) on growing rats and blood indices in rats". Proceedings of the International Union of Physiological Sciences XVIII. P.5421. 1990.