



Bromate Content in Thirty Different Brands of Bread Baked in Port Harcourt Metropolis Rivers State, Nigeria

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ABSTRACT: This work considered the presence of potassium bromate in thirty different bread brands baked in Port Harcourt metropolis of Rivers State, Nigeria. The analysis was carried out in two locations of South and North, Port Harcourt metropolis with fifteen samples for each. The study revealed the presence of potassium bromate in all the samples 0.025-0.058 mg/Kg and 0.011-0.059 mg/Kg for south and north respectively. It also revealed the mean to be 0.048 ± 0.010 mg/Kg for south and 0.041 ± 0.008 mg/Kg for the north. Apart from one of the samples (B10analyzed, the concentrations ranged from), all the values were above the allowed limit by NAFDAC. The result showed that both locations have bakeries that use bromate content higher than permissible limit. It is therefore advisable that consumption of bread from the study area may be of harmful effect due to bioaccumulation over a period of time.

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Bread as the oldest staple food, is of great historical importance to many societies and nations around the world (Abu-Obaid *et al.* 2016). This could be traced back to the ancient Israel where they also used bread while in the land of Egypt. It is a common food for all classes of people because of its nutritive value and availability. Historically, it has been proven that bread as a commodity, had served as a currency in some societies as it was used for purchase of basic necessities money could buy (Maziya-Dixon *et al.* 2004). In Nigeria bread is an essential food item because it is readily available and at a very low price. This makes it possible for all income earners to afford it. It is extensively consumed in homes, restaurants and hotels (Emeji *et al.*, 2009). It is mainly produced from wheat, with addition of other components like yeast, sugar, baking powder, potassium bromate etc. Shuaibu and Ibrahim (2012) examined breads around Katsina, their findings indicated that bakers within the study area exceeded the set limit. Abdull and Hassan, (2009) analyzed 15 bread samples from Hawler city of Iraq by spectrophotometric method and found potassium bromate in all the bread samples in the range of 11.09 – 67.45ppm.

Potassium Bromate acts as oxidizing agents, by helping to improve the dough by giving it long

elasticity, rises the bread and better quality of the final product. Potassium bromate though a bread quality improver but at high amount, is highly carcinogenic, causes low libido and renal damage. In some countries like India, Sri Lanka, Germany and Ugandan the use of potassium bromate as bread improver is highly prohibited and an offence. The world health organization and National Agency for Food and Drug Administration Control (NAFDAC) has stipulated the amount of bromate that should be used as bread improver, which they put at 0.02mg/Kg of bread produced (FAO/WHO, 1992; Akunyili, 2005). Though this limit has been set, bread producers sometimes still go beyond the set standard. This study is imperative to check the compliance of bread producers to the standard set by national and international agencies.

Therefore, this study was undertaken to determine the levels of bromate in selected bread samples consumed in Port Harcourt metropolis using UV/Vis Spectrophotometric method of analysis. This will help to check the possibility of exposure to bromate by consumers of such breads from the areas. This research work will help to also ascertain the level of compliance with the National limit of bromate in bread.

MATERIALS AND METHOD

Collection of Sample: Bread samples were collected from different bakeries within selected bakeries in Port Harcourt metropolis and analyzed using Ultra Violet Visible Spectrophotometric Method. A total of thirty (30) different brands of bread were used in this study, 15 samples each from both Port Harcourt South and North study locations.

Preparation of Sample: The method of (Alli *et al.*, 2013) was used for this experiment. 10g sample of the analyte was taken from the centre of the loaf of bread. This was dried in an oven for an hour at temperature of 75°C. The dried sample was pulverized and 1g of the sample was weighed into a clean 250cm³ beaker, to this was added 20cm³ of deionized water. The mixture was stirred thoroughly and filtered using a Whatman no 1 filter paper. 8cm³ of the filtrate solution was transferred into a 20cm³ volumetric tube and mixed with 1cm³ of 0.01M promethazine. 0.2cm³ of 12M hydrochloric acid was added; the mixture was shaken for 1minute and used for analysis.

Preparation of Standard Solutions: 50mg of potassium bromate was dissolved in distilled deionized water and diluted to 1 litre. 3.21g of promethazine hydrochloride (PTZ) was dissolved in distilled deionized water and diluted to 1 litre to obtain stock solution of 0.01M of PTZ. Also, 2.84g of promethazine was similarly dissolved in 1 litre of distilled deionized water to obtain stock solution of 0.01M promethazine.

Sample analysis: Qualitative tests were performed directly on a portion of each bread sample with 2cm³ of 0.01M promethazine and 0.6cm³ of 12M hydrochloric acid. Quantitative determination of bromated content in the bread samples was carried out following the spectrophotometric method described by El Harti *et al.* (2011). Absorbance of the sample solution obtained was measured using a spectrophotometer at 515nm. The concentration of bromate was calculated from the linear regression curve obtained from the working standards. The analysis was done in triplicate and the mean obtained.

Data analysis: Data obtained were analyzed using Microsoft Excel and results were expressed as mean±standard deviation.

RESULTS AND DISCUSSION

Results of this study revealed that all the bread samples analyzed contained potassium bromate (Table 1 and 2).

Result shown in table 1 is the concentration of bromate in bread samples obtained from different locations within Port Harcourt South, Rumueme, Mile 3 and its environment. The highest concentration of bromate was obtained in samples A7 (0.058±0.020mg/Kg), A2 = A10 (0.057±0.020 mg/Kg) and A4 (0.056±0.023 mg/Kg) while the least concentration where for samples A9, A11 and A5 with the following concentrations 0.025±0.003 mg/Kg , 0.027±0.001 mg/Kg and 0.039±0.003 mg/Kg respectively. The result above from the UV spectrophotometric method showed that the range was 0.025 to 0.058 mg/Kg while the mean value was 0.048±0.010 mg/Kg. The result clearly indicated that all the bread samples analyzed had concentrations of bromate at levels above the permissible standard set by NAFDAC for bread in Nigeria. This further showed that bread manufacturers in the study area of Port Harcourt south are still using bromate at higher concentration as required by the relevant agency (NAFDAC).

Table 2 showed the result from Port Harcourt North which comprises of Rumuokoro and its environs. The highest concentrations were for samples B4, B1 and B7 with the values of 0.059±0.021, 0.058±0.021 and 0.058±0.002 mg/Kg respectively. The lowest values were for samples B3 (0.011±0.001 mg/Kg), B10 (0.020±0.001 mg/Kg) and B15 (0.034±0.001mg/Kg). The entire samples were higher in concentration than NAFDAC limit except sample B3 and B10 that is same as the limit. The range is 0.011 to 0.059 mg/Kg and mean of 0.041±0.008 mg/Kg. The maximum limit of potassium bromate allowed in bread around Nigeria by the NAFDAC is 0.02 mg/Kg (Ekop *et al.*, (2007).

Table 1: Concentration of Bromate in Bread from Port Harcourt South.

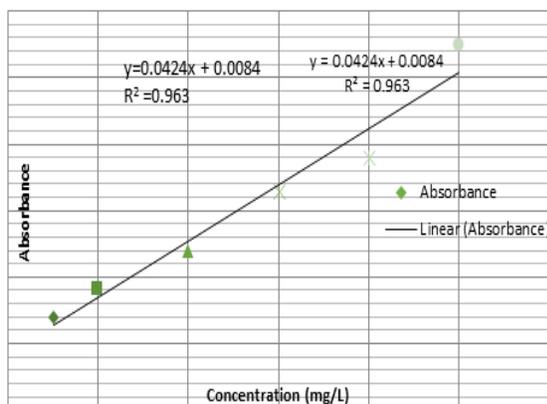
Bread Samples	Concentration of Bromate (mg/kg)
A1	0.054±0.003
A2	0.057±0.020
A3	0.056±0.002
A4	0.056±0.020
A5	0.039±0.003
A6	0.041±0.002
A7	0.058±0.020
A8	0.056±0.023
A9	0.025±0.003
A10	0.057±0.002
A11	0.027±0.001
A12	0.054±0.020
A13	0.041±0.021
A14	0.048±0.002
A15	0.045±0.003
Range	0.025-0.058
Mean	0.048±0.010
NAFDAC Standard	0.020

ND= Non Detected; Mean ± Standard Deviation (Std); Analysis was done in triplicate

Table 2 Concentration of Bromate in Bread from Port Harcourt North

Bread Samples (mg/kg)B1	Concentration of Bromate 0.058±0.021
B2	0.039±0.010
B3	0.011±0.001
B4	0.059±0.021
B5	0.050±0.020
B6	0.039±0.001
B7	0.058±0.002
B8	0.041±0.010
B9	0.040±0.002
B10	0.020±0.001
B11	0.041±0.010
B12	0.036±0.002
B13	0.054±0.021
B14	0.043±0.002
B15	0.034±0.001
Range	0.011-0.059
Mean	0.041±0.008
NAFDAC Standard	0.020

ND= Non Detected; Mean ± Standard Deviation (Std); Analysis was done in triplicate

**Fig 1:** Calibration curve for bromate

All the samples analyzed in this study had potassium bromate in excess of the allowed concentration. Similar Studies by Emeje *et al.*, (2010) carried out in the eastern part of the country also revealed findings that are higher than this work. This study shows result that is far below works by Magomya *et al.*, (2013) who reported potassium bromate level at 2.46 to 13.60 mg/kg for bread samples around Zaria and its environment. This substance is also a mutagen and has shown the potential to cause cancer in laboratory animal (Atkins, 1993). Sai *et al.* (1991), reported that toxicological studies have convincingly shown that potassium bromate affects the nutritional quality of bread by degrading the main vitamins available. High temperature and heat also affects the bread quality and the bromate content of bread. The carcinogenic effect of bromate in laboratory animals has been studied and reported by several scholars (Kurokawa *et al.*, 1990,

Ekop *et al.*, 2007). The levels of potassium bromate in the bread samples were above the limits by NAFDAC. It indicated that bread sold within Port Harcourt is not within safe limits of potassium bromate content. It indicated that potassium bromate is still in use as oxidizing agents for bread which helps to improve its quality but with harmful health effect.

Conclusion: The study reveals that all but few of the analyzed bread brands were above the safe limits of bromate in bread as specified by the US Food and Drug Administration from where NAFDAC also derives her specifications. Therefore, there is the need for authorities to checkmate the bakeries and producers as to ascertain compliance to standard and safety of humans from the side effect that may result from consuming such breads.

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