TETFUND/UNIBOKKOS/ARJ/3

PHYSICOCHEMICAL ANALYSIS OF BREAD SOLD IN MUBI TOWN OF ADAMAWA STATE.

[1]Musa, Y. [1]Alexander, P. [2]Barminas, J. T. [1]Ezekiel, W. T. and [1]Magilli S.
[1]Department of Chemistry, Adamawa State University Mubi, Adamawa State. Nigeria
[2]Department of Chemistry, Modibbo Adama University of Technology, Yola, Adamawa State. Nigeria
ymusa48@yahoo.com
+2347033321798, +2347053028889

ABSTRACT

This study deals with only the physicochemical analysis of bread sold in Mubi Town of Adamawa State. Ten Bread samples from Mubi-Town, five each from Mubi-North and Mubi-South local Government Areas of Adamawa State were analysed. The ten bread samples were analysed for their physicochemical parameters. The physical parameters, viz: colour, taste and texture were determined using sense organs, moisture (hot air oven method), ash content (direct method), density and specific gravity were determined using standard method while the odour was determined by moderate heating on a hot plate. Sodium and potassium was determined using flame photometer, nitrogen as crude protein by Kjeldahl method and potassium bromate by the qualitative method. The samples were all white in colour, all had sweet taste and aroma, the texture was soft and consistence and some, soft and crumbly. The pH, density, moisture, ash and organic matter ranged from 5.35 ± 0.3 to 5.90 ± 0.5, 0.39 ± 0.32 to 0.68 ± 0.4g/cm^3, 29.11 ± 4 to 34.56 ± 9%, 1.93 ± 0.3 to 2.73 ± 0.9% and 97.23 ± 0.9% to 98.07 ± 0.3% respectively. Potassium, sodium and crude protein ranged from 15.00 ± 4.1 to 25.00 ± 7.1%, 3.05 ± 1.4 to 4.88 ± 0.8% and 10.96 ± 0.6 to 14.00 ± 0.9% respectively. This shows that, sodium potassium and crude protein were present in the bread samples with potassium and crude protein being dominant among the parameters studied. The study also revealed that, potassium bromate is present in five bread samples.

KEYWORDS: Bread, Flour, Physicochemical Parameters, Potassium Bromate,

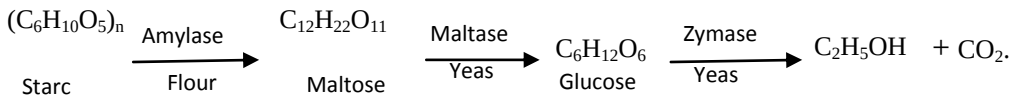
INTRODUCTION

Breads are group of staple food that is prepared by baking dough, consisting of flour and water. It may be leavened or unleavened. Salt, fat and leavening agent such as yeast are common ingredients, though bread may contain other ingredients such as milk, eggs, sugar, spices, etc.

It is one of the oldest prepared foods dating back to Neolithic era (Harold, 2004). The bread produced were probably cooked version of grain made from ground cereal and water, and may have been developed by accidental cooking or deliberate experimentation with water, grain and flour (Harold, 2004).

Bread being a staple food has a wide acceptance and perception by consumers in the world particularly in Mubi-North and South Local government Area of Adamawa State (Andrawus, 2005).

In general, bread is made from flour, water, salt and yeast. It has a honeycomb structure and may be regarded as solid foam, which has pockets of carbon dioxide distributed uniformly throughout its bulk structure. Sugars naturally present in flour and maltose made available by the action of amylase are hydrolysed to glucose and this is fermented by enzymes present in yeast. Alcohol and carbon dioxide are produced and the later (i.e. carbon dioxide) aerates the dough (Fox and Cameron, 1982). The reaction for the fermentation process is given below:



Flour as the major source of bread is the single most important basic ingredient in bread making. Breads are obtained from wheat (the grain most commonly used), rye, barley, corn, rice, soybeans, potatoes, and cassava. The various types of wheat flour used in bread making include: whole meal, white flour, wheat grain, and brown bread (file://\\scafé\hareddocs\bread-mSN Encarta.htm).

Cassava flour being a multipurpose product is commonly used as a modern ingredients

compared with wheat in baking industry (Akoroda and Ekanayake, 1998). In Nigeria, 10% of cassava flour is blended with wheat flour to produce composite flour bread and confectionary baking, thus, there is a high demand for cassava flour (Umahi, 2007). However, not all processed cassava flour in the market is acceptable because of the high quality standards set by the regulatory agencies. Bread forms the main part of the average person's diet for centuries (Moorshead, 2008). As a staple rich complex carbohydrate, bread can increase stamina, fight fatigue, boost energy and performance (http://www.fabflour.co.uk/contents/nutrientscarbohydrate.html).

Bread is also important as it provides digestible carbohydrate, dietary fibre, essential fatty acids, minerals and vitamins. Hence, bread is important as the key source of nutrient in our daily diet (Fox and Cameron, 1982). Enriched bread provides important amount of protein, starch, iron and vitamin B-niacin, riboflavin and thiamine (Anderson *et al.*, 2001). Whole wheat bread provides almost all the natural vitamins and minerals of wheat including; niacin, riboflavin and thiamine, vitamin E, iron and calcium (Anderson *et al.*, 2001).

Cassava flour also supplies 70% of daily calories intake of peoples' diet in Nigeria and many other African Countries (Umahi, 2007). However, cassava flour is low in protein, vitamins, fats and minerals (Akoroda and Teri, 1999). Despite the high production and consumption of bread in Mubi town, the quality of these breads is questionable. Therefore, this study would help to reveal the quality and nutritional value of the bread consumed in these areas. Hence, this study is aimed to determine the physiochemical parameters of bread consumed in Mubi Town of Mubi-North and Mubi-South Local Government Areas of Adamawa State.

MATERIALS AND METHODS

The bread samples studied were collected through purchase from Mubi-Town of Mubi-North and Mubi-South Local Government Areas of Adamawa State in the month of June and July 2012, three consecutive times at two weeks interval. Ten bread samples were analysed, five each from Mubi-North and Mubi-South respectively. Random sampling technique was adopted.

Sample preparation

Bread samples were prepared by drying it in an oven at $105\pm1^{o}C$ to constant weight and allowed to cool. After cooling, the samples were ground to a smooth powder using pestle and mortar then sieved using 400μm mesh sieve. Samples of the dried powdery bread were reduced in size by a process known as conning and quartering method (Kirk and Sawyer, 1991).

Determination of the Physicochemical Parameters.

The physical parameters such as colour, taste, texture, moisture (hot air oven method), ash content (direct method), density and specific gravity were determined using the methods described by AOAC, (2000), while the odour was determined by moderate heating on a hot plate. Sodium and potassium was determined using flame photometer, nitrogen as crude protein by Kjeldahl method and potassium bromate by the qualitative method as described by AOAC, (2000).

RESULTS AND DISCUSSIONS

Physical Parameters

Table 1 shows the result of physical parameters of bread samples studied.

All the bread samples were white in colour. The colour of these breads depends on the colour of the flour used and the condition of baking such as time and temperature (Pomeranz and Shellenberger, 1971). The colour of the flour could be due to the use of bleaching agent as these changes the colour of the flour (Pomeranz and Shellenberger, 1971). All the bread samples had sweet aroma on heating due to the release of volatile flavouring compounds. All the bread samples had sweet taste. The sweet taste of the samples might be due to the addition of sugar during dough making or the presence of natural sugar in flour.

All the bread samples were soft and consistent in texture except sample B and H that were soft and crumbly.

The pH of the bread samples studied ranged from 5.35 ± 0.3 to 5.92 ± 0.5, which shows that the bread samples were slightly acidic. The pH of flour was reported to range from 6.0 to 6.8 (Kirk and Sawyer, 1991). Sample E gave the highest pH value while sample H gave the lowest value. Practically, all foods have pH values lower than 7.0 (Kirk and sawyer, 1991). The pH of bread samples could be due to the addition of bleaching and maturing agents by the millers to produce flour of desired colour and baking characteristics (Kirk and sawyer, 1991).

The density of the bread samples ranged from 0.39 ± 0.2 to 0.68 ± 0.2 while the specific gravity ranged from 0.44 ± 0.2 to 0.78 ± 0.2 respectively. The density of a substance is the measure of its heaviness of the mass of the substance (Wilson and Buffa, 2000). These bread samples were less dense than water due to porous air spaces in bread.

The moisture content of the bread sample ranged from 29.11±4 to 34.56±9% for F and J respectively. The moisture contents do not fall within the standard range of moisture content in bread, which is 10-14% (Ihekoronye and Ngoddy, 1985). The increase in moisture content of the bread samples studied might be due to the quantity of water used in dough mixing or as a result of the presence of bound water, free water in the bread or the period when the sampling was done (Kirk and Sawyer, 1991).

The ash content of the bread samples studied ranged from 1.93 ± 0.3 to 2.73 ± 0.9% which was higher than ash content of wheat flour of 0.60 to 1.10% (Kamel and stauffer, 1993). The high value means that, the bread samples have high mineral content to those of the wheat flour as reported above which could be due

the addition of ingredients during bread making.

The organic matter content of the samples ranged from 97.23 ± 0.9% to 98.07 ± 0.3% in which sample G has the lowest while sample F has the highest. The high organic matter of the bread samples studied could be attributed to the organic matter content of wheat and cassava flour used in for the bread making.

Chemical Parameters.

The chemical elements studied in breads were sodium, potassium, nitrogen as crude protein and potassium bromated.

The potassium content of the samples ranged from 15 ± 4.1 to 25 ± 7.1% with sample B having the highest value while sample G has the lowest value. Sodium content of the bread samples ranged from 3.05 ± 1.4 to 4.88 ± 0.8%. Sample F has the highest value of sodium content while sample H contains the lowest value. The difference in potassium and sodium content could be due to the type and quantity of ingredients added during bread making.

The crude protein of the bread sample analysed ranged from 10.96 ± 0.6 to 14.00 ± 0.9 with the highest value in sample B and sample G having the lowest. The standard of protein in bread is 8-10% according to Ihekoronye and Ngoddy, 1985.

Potassium Bromate.

The analysis conducted revealed that, bread sample A, B, E, and G are bromated free while sample C, F, H, I, and J shows black specks which means that potassium bromated ($KBrO_3$) is present. The presence of potassium bromated could be attributed due to the addition of potassium bromate ($KBrO_3$) from the milling factory (millers) to improve the quality of the flour produced (Kirk and Sawyer, 1991), or from the bakers during dough mixing. There was no facility for the quantification test of potassium bromate.

CONCLUSION

The result of this study shows that, sodium potassium and crude protein were present in the bread samples. Potassium and crude protein were dominant among the parameters studied. The study also revealed that, potassium bromated is present in five bread samples which is a source of worry. Hence there is a need for the monitoring agencies to checkmate bread production in Mubi Town of Adamawa State.

Table 1: Result of Physical Analysis of Bread Studied, June and July, 2012.

Sample	Texture	pH	Density (g/cm^3)	Specific gravity	Moisture (%)	Ash content (%)	Organic Matter content (%)
A	Soft and consistent	5.83±0.8	0.55±0.2	0.63±0.2	30.78±3	2.53±0.4	97.47±0.4
B	Soft and crumbly	5.69±0.1	0.52±0.2	0.60±0.2	30.20±4	2.53±0.9	97.47±0.9
C	Soft and consistent	5.51±0.2	0.68±0.4	0.78±0.2	32.00±3	2.53±0.8	97.47±0.9
D	Soft and consistent	5.61±0.3	0.51±0.2	0.58±0.2	29.89±1	2.07±1.0	97.93±1.0
E	Soft and consistent	5.92±0.5	0.54±0.2	0.62±0.2	29.89±3	2.06±0.6	97.40±0.6
F	Soft and consistent	5.74±0.4	0.56±0.1	0.67±0.1	29.11±4	1.93±0.3	98.07±0.3
G	Soft and consistent	5.73±0.5	0.39±0.2	0.44±0.2	29.22±2	2.73±0.9	97.23±0.9
H	Soft and crumbly	5.35±0.3	0.55±0.3	0.67±0.3	30.00±3	2.06±0.7	97.94±0.7
I	Soft and consistent	5.60±0.3	0.42±0.1	0.48±0.2	29.33±5	2.60±0.7	97.40±0.7
J	Soft and consistent	5.76±0.4	0.64±0.4	0.73±0.3	34.56±9	2.67±0.2	97.33±0.2

All values are mean and standard deviation of three replicate readings in % except pH, density and specific gravity.

The present study deals with only the physicochemical analysis. Some mineral element, trace elements and heavy metal were not determined due to time factor, and lack of equipments such as atomic Absorption Spectrophotometers' lamp for determining other elements. Therefore, further studies should be carried out to ascertain these elements and the quantitative determination of potassium bromate in these samples (breads) studied.

Finally, the Local Government in collaboration with the State Government should implement a policy for the supervision of Bakeries in Mubi town. Also, the National Agency for Food and Drug Administration Control (NAFDAC) should monitor the Bakeries that produce bread with potassium bromated to reduce the risk of contacting disease. NAFDAC and other related bodies especially the federal and state Government should assist in such research work.

Table 2: Result of Chemical Analysis (in %), June and July, 2012.

Sample	Sodium	Potassium	Crude Protein	Potassium Bromate
A	3.60±1.0	18.30±4.7	11.81±0.6	Absent
B	3.60±0.8	25.00±7.1	14.00±0.9	Absent
C	4.65±1.2	18.30±2.7	12.42±0.9	Present
D	3.87±1.7	18.30±4.7	12.69±0.4	Absent
E	3.52±0.4	16.70±4.7	12.42±0.9	Absent
F	4.88±0.8	18.30±4.0	11.56±0.2	Present
G	3.77±1.8	15.00±4.1	10.96±0.6	Absent
H	3.05±1.4	20.00±0.0	12.13±0.5	Present
I	4.20±0.3	19.20±5.9	13.13±1.0	Present
J	3.13±1.4	18.30±4.7	12.40±0.7	Present

All values are mean and standard deviation of three replicate readings in % except potassium bromate.

REFERENCES

Akoroda, M. O. and Ekanayake, I. J. (1998), Roots Crops and Poverty Alleviation, *Proceedings of the 6th Triennial Symposium of the International Society for Tropical Roots Crops-Africa Branch (ISTRC-AB)* Held at Lilingwe, Malawi Pg. 338

Akoroda, M. O. and Tery, J. M. (1999), Food Security and Crop Diversification in Southern African Development communities (SADC) Countries. The Role of Cassava and Sweet Potatoe, *Proceedings of Scientific Workshop of the Southern African Roots Crops Research*

Network (SARRNET), Held at Lusaka, Zambia.

Anderson, M. A., Dede, C. Fantona, L., Gonzalez, A. B., Panika, K. N., Taylor, W. and Wough, S. L. (2001), *World Book Encyclopedia* B. Vol. 2 World Book Inc. A Scoth. Fetzer Coy., Chicago Pp. 588, 589

Andrawus, D. (2005), Survey of Bread Consumption in Mubi-Town, Project Research Work, Dep't of Food Sci. and Tech. federal Polytechnic Mubi, Unpublished. Pg. 1

Fox, B. A. and Cameron, A. G. (1992), *Food Science Nutrition and Health*, 5th Edition, Edward Arnold Ltd, London UK, Pg. 22, 250

Fox, B. A. and Cameron, A. G. (1982), *Food Science; A Chemical Approach*, 4th Edition, Macmillan Indian Ltd., Banglore Great Britain, Pg. 154

Harold M., (2004), on Food and Cooking, Scribner Pg 517. ISBN 0-684-80001-2 Retrieved online at http://www.en.wikipedia.org/wiki.bread

Ihekoronye, A. I. and Ngoddy, P. O. (1985), *Intergrated Food Science and Technology for the Tropics*, Macmillan Press Ltd, London, UK Pg, 87, 88

Kamel, B. S. and Sawyer, C. E. (1991), *Advances in Baking Technology*,1st Edition VCH Publishers Inc. New York, Pg.180, 185

Kirk, R. S. and Sawyer, R. (1991), *Pearsons' Composition and Analysis of Food*, 9th Edition, Longman, Singapore Publisher Ltd., Singapore, Pg. 9. 10. 13. 15. 32. 35. 148. 150. 159

Moorshead, H. (2008), History Magazine of Bread. http://Historymagazine.com/Bread.html.

Official Method of Analysis of Association of Analytical Chemist, (AOAC), International (2000), 17th Edition, Gaithersburg, Mary-Land, USA, Chapter 9. Pg.1, 2, 3, 19, Chapter 32; 19, 20

Pomeranz, Y. and Shellenberger, J. A. (1971), *Bread Science and Technology, the AVI* Publishers Coy. Inc. Pp. 138, 169

Umahi, H. (2007), Making Cassava a Staple Food, Paper Article Retrieved online on 24th July, 2007 at: http://www.sunnewsonline.come/homepages/features/arts/2007/arts-24-07-2007.002.htm

Wilson, J. D. and Buffa, A. J. (2000), *College Physics* 4th Edition, Prentice-Hall, Inc. Upper Saddle River, New Jessey USA Pg, 12, 13, 309-314

Yoga, (2003), Minerals, Properties of Minerals, http://hatthayogalesson.com/mineral.htm

Sources of Bread on the web, (2008), File//\\1cafe\shareddocs\bread-MSN-Encarter.htm

Nutritional Content of Wheat flour on the web, (2008). (http://www.fabflour.co.uk/contents/nutrientscarbohydrate.html).