Pakistan Journal of Nutrition 9 (6): 531-534, 2010
ISSN 1680-5194

Acceptability Studies on Bread Fortified with Tilapia Fish Flour

R.O. Adeleke and J.O. Odedeji
Department of Food Technology, Osun State Polytechnic, Iree, Osun State, Nigeria

Abstract: This study was conducted to assess the acceptability of bread samples produced by fortification of wheat flour with Tilapia Fish Protein Flour (TFPF) in varying proportions (5, 10, 15 and 20% by weight of wheat flour). Bread produced from 100% wheat flour served as the control. The fortified bread and the control samples were subjected to proximate and organoleptic analysis. The result of proximate analysis revealed that the incorporation of TFPF into wheat flour resulted in improvement in the nutritional value of bread sample. The protein content increases as more and more TFPF was added. The protein content for the control sample was 9.08% while the values for fortified bread samples ranged between 18.01 and 10.59% with sample coded 411 (80% wheat flour: 20% TFPF) having the highest value. The result of organoleptic analysis revealed that there was no significant difference among the samples in term of taste, aroma, crust and crumb colour and overall acceptability. Acceptable fortified bread could therefore be produced from wheat and TFPF.

Key words: Wheat flour, bread, fortification, tilapia fish protein flour

INTRODUCTION

Bread is a baked food produced from flour that is moistened, kneaded, proofed with the addition of yeast. Other raw materials for bread making apart from wheat flour include sugar, baking fat, yeast, vegetable oil, salt and water. Hard wheat flour is used for bread making because of gas produced by yeast during proofing and baking (Famosinpe, 2001).

Bread is highly nutritious eaten in one form or another by nearly every person on earth. An excellent source of vitamins, protein and carbohydrates bread has been an essential element of human diets for centuries in all regions (Ryan, 2005). Bread is a solid foam, a typical bread has the crust with the characteristic golden brown colour and white crumbs. Bread has a short life due to its chemical composition and moisture content compared to other baked products.

Nutritionally, bread contains high percentage of carbohydrate and fat both of which are needed for energy production and source of calories. Other nutrients like vitamins, mineral and protein are relatively in small proportion. The problems of malnutrition in Nigeria although different in magnitude and severity among different areas are due to protein, vitamins, iron and other mineral deficiency (Adebooye, 1996). Many Nigeria consume bread without any nutrient supplement like butter, geisha etc suggesting the problem of malnutrition. Therefore there is the need to enrich or fortify bread in order to improve its nutritional value.

Food fortification is the addition of one or more essential nutrients to food weathers or not it is normally contained in the food, for the purpose of preventing or correcting a demonstrated deficiency with one or more nutrient in the population or specific population group (Brekkan, 1996). A nutrient or substance is considered an appropriate fortifier when and only the nutrient is stable in the food under normal conditions of storage, distribution, and use. Fortification of food has become a means of ensuring nutritional adequacy of the diet. Example of appropriate food fortifiers include soy flour, fish protein concentrate which are rich in protein.

Fish protein concentrate is produced from edible parts of fish, which is properly dehydrated and milled into flour. It is otherwise referred to as fish flour. It has attractive colour, pleasant flour, and of reduced moisture content which make it to have relatively longer shelf life. Nutritional studies have shown that fish protein concentrate can be added to weaning food growing infants and nursing mothers.

This paper is therefore on the acceptability of bread fortified with Tilapia Fish Flour in order to ensure the nutritional adequacy of bread. The present study is therefore aimed at proximate and organoleptic analyses of fortified bread and the control samples.

MATERIALS AND METHODS

The materials used for this project work include wheat flour, granulated sugar, yeast, shortening agent all of which were purchase at Osogbo Osun State. The Tilapia Fish used for the production of fish protein concentrate was purchased at Eko-Ende Dam also in Osun State. Equipment used include Oven, weighing balance, mixer, kjedahi apparatus, soxhlet apparatus, muffle furnace. All the chemicals used were of food grade.

Production of tilapia fish protein concentrate: Tilapia fish that was purchase at Eko-Ende Dam was sorted and graded; the fish was washed thoroughly with

Corresponding Author: R.O. Adeleke, Department of Food Technology, Osun State Polytechnic, Iree, Osun State, Nigeria

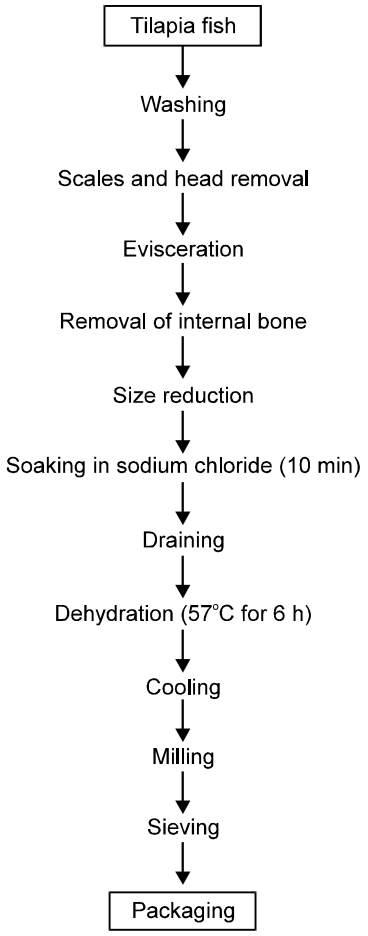

Fig. 1: Flow chart tilapia fish protein concentrate production (Ihekeronye, 1985)

Sample codes and designation

Sample codes	Designation
426	100% WF : 0% TFPF
591	95% WF : 5% TFPF
477	90% WF : 10% TFPF
499	85% WF : 15% TFPF
411	80% WF : 20% TFPF

WF: Wheat Flour; TFPF: Tilapia Fish Protein Flour

potable water so as to remove all extraneous matters. The scales and heads were removed and thereafter the fish was eviscerated and bones were removed. The fish was washed again in order to remove blood and the intestinal waste from the fish.

The eviscerated fish was them sliced into different sizes and was then soaked in sodium chloride (Salt) at room temperature 27±2°C for 10 min to reduce the moisture content through Osmotic dehydration and to improve taste. Thereafter it was drained and drying was done for 6 h. After cooling inside desiccators, the dried was milled to powdery form sieved to have fine powder and was stored in an air-tight container for further use.

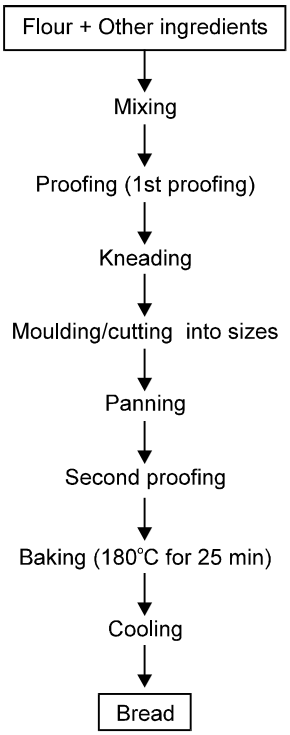

Fig. 2: Flow chart for production

Production of bread fortified with fish protein concentrate: All ingredients were weighed i.e. flour, salt, sugar, fish flour, butter, yeast, shortening agent using a precision mettler balance. The ingredients were added to the mixer and were thoroughly mixed. The mixed dough was then placed in large metal containers or trough and held in an insulated room at about 27°C and in an atmosphere of high humidity to allow fermentation. During fermentation the mass of dough is kneaded several times to allow the escape of some air which is produced continuously during the fermentation.

After fermentation, the dough was divided into pieces of sizes which will eventually make up the finished loaf. This was done by a machine which measures the dough by volume and cuts of pieces of the desired size. The fermenting dough was moulded and dropped into baking pans which had been formerly cleaned and rubbed with oil. It was then baked in an oven. During the first stages in the oven, the dough continues to ferment and increase in volume. The bread was baked at 180°C for about 25 min. The baked loaves were cooled to permit efficient slicing and to prevent moisture formation under the bread wrapper. The bread was thereafter packaged and stored for further research work.

Proximate analysis: The proximate analysis of the samples and the control were carried out using the method described by Association of Officer Analytical

Chemist (AOAC, 1990). Carbohydrate determination was done by difference between all the proximate constituent and 100.

Organoleptic analysis: Organoleptic analysis was carried out using multiple comparison test. Nine panelists were used to evaluate the sample for taste, crust and crumb colours, texture, flour and overall acceptability. The data collected were thereafter analyses statistically to determine if there is any significant difference among the samples in terms of all the parameters.

RESULTS AND DISCUSSION

Proximate analysis results: The results of proximate analysis on the five bread samples are as presented in Table 1.

Results are means of duplicate values: Table 1 shows the result obtained for proximate analysis of fortified bread and that of reference sample. From the table the moisture content for fortified bread samples ranged between 29.10 and 26.28% with sample coded 591 having the highest value. The moisture content for the control sample was 25.00%. The relatively high moisture content observed for fortified bread samples might be due to the incorporation of Tilapia Fish Protein Flour (TFPF). Fish is high in water content; equally protein has a high water holding capacity. Bread, as a product belong to the class of Intermediate Moisture Food (IMF), hence, there can be a little bit of moisture in the product. The products however fall within the acceptable limit of IMF product (Ihekoronye, 1985). The fortified bread samples recorded higher values for protein. This is due to the addition of the TFPF. The values for protein ranged between 18.10 and 16.45% with sample coded 411 having the highest value. The protein content for control sample was 9.08%. The fish protein concentrate used to fortify the bread contains high quality protein more than the control sample which leads to the increase in the percentage protein recorded in fortified bread samples. Proteins serves as antibodies, they serve as primary sources of amino acids, the building block of cellular protein. The fat content was found to be on the increase as more and more TFPF was added. Sample coded 426 which is the control had the least value of fat of 2.15% Bread sample with 5% TFPF had 2.19% followed by sample with 10% TFPF recorded 2.30% while sample with 20% TFPF had the highest value of 2.88%. the ash content of the control sample and the fortified samples were very close. Sample coded 411 with 20% TFPF recorded the highest value 2.88%. Ash content of food product gives an insight to the content of food products. The crude fibre content of the fortified bread samples ranged between 0.85 and 0.73%. Control sample recorded 0.88%. The values are very close. As more and more TFPF was added the crude fibre is on the decrease. Crude fibre through its water absorption capacity aid peristalsis movement of food through the digestive tract. The result of carbohydrate content revealed that the control sample had the highest value ranging from 58.00-48.9%. As more and more TFPF was incorporated. The carbohydrate content is on the decrease. This might be due to the effect of starch dilution through the incorporation of the TFPF.

However, fortified bread samples had appreciable quality of carbohydrate. Their values were very close to that of the control. Samples coded 591 and 477 recorded values that were very close to that of the reference sample 58.00 and 57.86% respectively. These samples equally had higher proximate constituents than the control. Hence, these samples can really compete with the control. Nutritionally, these samples stand out. All the fortified bread samples recorded dry matter (g/100 g) values less than the control through very close. The control sample had a value of 74.75 (g/100 g) while the fortified samples values ranged between 73.75 and 70.90 (g/100 g).

Fortification in this regard therefore leads to production of more nutritious, nourishing and more acceptable bread sample.

Organoleptic analysis result: The result of organoleptic analysis carried out on the bread samples is as presented in Table 2.

From the table, the F-values obtained for the bread samples were less than Q-factor (3.01) which indicates that there is no significant differences among the sample in term of all the parameter evaluated at 5% significant level. This therefore signifies that acceptable bread sample can be produced from fortification of

Table 1: Proximate analysis result for the bread samples

Sample code	Protein (%)	Moisture content	Ash (%)	Crude fibre (%)	CHO (0%)	Fat (%)	DM (g/100 g)
426R	9.08	25.00	2.46	0.88	60.20	2.15	74.75
591	10.59	29.10	2.38	0.85	58.00	2.19	70.90
477	12.14	26.28	2.38	0.83	57.86	2.30	73.75
499	16.45	26.78	2.39	0.78	48.91	2.59	71.30
411	18.01	26.75	2.58	0.73	49.05	2.88	73.13

DM = Dry Matter (g/100 g)

Table 2: Organoleptic analysis result table

Parameter	F-Sample	Q-Factor
Texture	1.62	3.01
Taste	1.13	3.01
Crust and crumb colour	1.00	3.01
Aroma	1.00	3.01
Overall acceptability	1.30	3.01

wheat flour with Tilapia Fish Protein Flour in bread production using any of the blend ratios.

However, sample coded 411 i.e 80% wheat and 20% TFPF received the least preference.

Conclusion: From this work, it has been established that production of acceptable bread sample from wheat flour fortified with Tilapia Fish Protein Flour is technically feasible. The proximate analysis results showed increment in the proximate constituents of bread as more and more TFPF was added which make the product to meet the dietary requirements.

Fish protein concentrate is therefore an excellent fortifier in bread production as well as other bakery products. In order to improve the nutritional values of bakery products especially bread which is a 'staple' in Nigeria diet Tilapia Fish Protein Flour could be used. This will lead to production of more nutritious, nourishing and acceptable bread.

REFERENCES

Adebooye, O.C., 1996. Proximate composition and nutrient analysis of six selected leafy vegetables of South West Nigeria. Ife J. Agric., 18: 56-63.

AOAC, 1990. Association of Official Analytical Chemists. Official Methods of Analysis. 15th Edn., Washington DC., pp: 90-102.

Brekkan, 1996. Fish protein concentrate. Advance in Fish Science and Technology. Pg. Google Website.

Cookery Microsoft (R) Encarta (R) 2006 (CD), Redmond, W.A: Microsoft Corporation, 2005.

Famosinpe, T., 2001. Production of bread from composite flour. A Thesis Submitted to the Food Technology Department, University of Ibadan.

Ihekoronye, 1985. Integrated food science and technology for the tropics. Macmillan Publishers Ltd., London, pp: 260-264.

Ryan, Nacy Ross Bread Microsoft (R) Encarta (R), 2006. (CD) Redmond W.A: Microsoft Corporation, 2005.