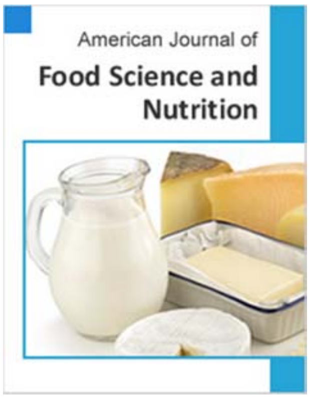
American Journal of Food Science and Nutrition
2017; 4(4): 42-47
http://www.aascit.org/journal/ajfsn
ISSN: 2375-3935

American Association for Science and Technology



Quality Evaluation of Composite Bread Produced from Wheat, Cassava, Plantain, Corn and Soy-bean Flour Blends

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Citation
Oluwafemi Gbenga Isaac, Seidu Kudirat Titilope. Quality Evaluation of Composite Bread Produced from Wheat, Cassava, Plantain, Corn and Soy-bean Flour Blends. *American Journal of Food Science and Nutrition*. Vol. 4, No. 4, 2017, pp. 42-47.

Keywords
Composite,
Sensory Attribute,
Proximate,
Evaluation

Received: April 9, 2017
Accepted: May 14, 2017
Published: August 23, 2017

Abstract
The study evaluated the proximate and sensory qualities of bread produced from composite flour (Wheat, cassava, plantain and defatted soya-bean) were manually processed separately to produce composite flour at different substitution level for bread production. Proximate analysis was determined and the sensory attributes were evaluated respectively using standard procedures. The result of the analysis showed that moisture content ranged between 9.03% and 9.28%, ash content between 1.81% and 2.41%, crude fibre between 9.07% and 9.25%, crude fat between 20.65% and 21.52%, crude protein between 10.33% and 11.00%, estimated carbohydrate between 46.82% and 49.10%. Also, there were significantly different ($p < 0.05$) in the results for sensory evaluation with values ranging from 5.53 to7.73, 5.40 to 7.67, 5.73 to 7.60, 5.33 to 7.20, 5.80 to 7.87 for appearance, taste, texture, flavour, overall acceptability respectively. The study showed that composite bread of 65% wheat flour, 10% cassava, 10% Plantain, 15% soya beans had appreciable amount of protein, fat and lower carbohydrate content compare with composite bread of 65% corn flour, 10% cassava, 10% Plantain, 15% soya beans. Sensory evaluation results also showed that there was significant different between the products. The control sample was rated high in all the sensory attributes except for flavour of sample B which was not significantly different from the control.

1. Introduction

Bread is a staple food prepared by cooking dough of flour and water and possibly more ingredients. Bread is a product of high nutritional value and is consumed in most part of the world * [1]. Providing energy, iron, calcium, vitamins and protein. it is a perishable product and its production involves the cooking or baking of dough obtained by mixing wheat flour, edible salt (table salt) and portable water (drinking water), fermented by species of budding yeast used in baking such as *saccharomyces cerevisiae* and with or without the inclusion of any special component [2]. Production of baking products such as bread, cakes, bun, doughnuts, and biscuit generally used wheat flour, as a result of the nature and functional properties of the wheat flour proteins. But local climatic conditions in tropical countries such as Indonesia are not suitable for profitable wheat production, and consequently, Indonesia has been completely dependent on important dies were reported on the use of wheat for manufacture of baked products. For this reasons, the research focused on composite flour was defined as a mixture of several flours obtained from roots, tubers, cereals, and legumes with or without the addition of wheat [3]. Composite flours have been used extensively and successfully in the production of baked foods. Some studies were reported on the use of cereal-tuber-legume combination for the production of various products [4] and [5]. It can have deduced from these reports that the qualities of product depend on the proportional composition of the composites and flour properties [5]. However, [6] define composite flour as a mixture of flours, starches and other ingredients intended to replace wheat flour totally or partially intended to replace wheat flour totally or partially in bakery and pastry products. [3] also agreed with that as the composite flours used were either binary or ternary mixtures of flours from some other crops with or without wheat flour. Composite flour is considered advantageous in developing countries as it reduces the importation of wheat flour and encourages the use of locally grown crops as flour [7, 8]. Local raw materials substitution for wheat flour is increasing due to the growing market for confectioneries [9]. Thus, several developing countries have encouraged the initiation of programmed to evaluate the feasibility of alternative locally available flours as a substitute for wheat flour [10].

Moreover, the concept of composite technology initiated by the food and health organization [11] targeted reducing the cost of support for temperate countries by encouraging the use of indigenous crops such as cassava, yam, maize and others in partial substitution of wheat flour [12]. The Food and Agricultural Organization reported that the application of composite flour in various food products would be economically advantageous if the imports of wheat could be reduced or even eliminated since bread and pastry products are of high demand [13]. The bakery products produced using composite flour were of good quality with some characteristics similar to wheat-flour bread, though the texture and the properties of the composite flour bakery products were different from those made from wheat flour, with an increased nutritional value and the appearance. Apart from being a good source of calories and other nutrients, wheat is considered nutritionally poor, as cereal proteins are difficult in essential amino acids such as lysine and threonine [14]. Therefore, supplementation of wheat flour with inexpensive staples, such as cereals and pulses, helps improve the nutritional quality of wheat products [15]. For example, the protein quality of both the cassava-soya and the cassava-groundnut breads is higher than that of common wheat bread [16]. This study is aimed to produce bread from two different composite flour; wheat, cassava, plantain, defatted soya-bean flour and corn, cassava, plantain, defatted soy-bean flour and to evaluate the proximate composition as well as the sensory acceptability of the composite bread.

2. Materials and Methods

2.1. Materials

Whole wheat, corn, plantain, soybean, sugar, yeast, milk, butter, salt, egg and baking powder were obtained from Oja-Oba in Ado-Ekiti, Ekiti state, Nigeria. The cassava tubers were obtained from The Federal polytechnic Ado Ekiti farm and processed into flour while other raw materials were sorted to remove stones, dirt and unhealthy seeds. The sorted seeds and the other raw materials were processed into flour.

2.2. Sample Preparation

Wheat flour was produced from the whole wheat as shown in figure 1. It was cleaned by hand picking out all the foreign materials, the cleaned wheat was washed and soaked in water for about 1 hour, drained and oven dried for 24 hrs T 60^0c milled into flour, it was allowed to cool, sieved then packaged in polyethylene bay to prevent caking. Cassava was also processed into flour as shown in figure 2. The soybean seeds were processed into flour as shown in figure 3 using dry milling method. Plantain flour was also produced as shown figure 4 as follows: Plantains were washed, peeled and sliced to about 5 mm diameter using a slicer. The slices were then steamed for 15 min to inactivate enzymes. The pulp was drained and dried in a air oven drier at 60°C for 24 h, after which it was milled into flour. The same process was adopted for corn flour production as shown in figure 5. The flours were screened through a 0.25 mm sieve and packaged for further use.

2.3. Blend Formation

Two blends were prepared by mixing in the proportions of 65% wheat, 10% cassava, 15% soybeans, 10% plantain flour as sample A; sample B: 65% corn, 10% cassava, 15% soybeans and 10% plantain flour and that of the control is 100% wheat using machine food processor (Kenwood KM 201,, England) mixer

2.4. Baking Process

The two blend formulations were baked using the straight dough method. [17]. All ingredients were mixed in a Kenwood mixer (Model A 907 D) for 5 minutes. The dough were fermented in bowls, covered with wet clean muslin cloth for 55 min at room temperature (25°C), punched, scaled to 250 g dough pieces, proofed in a proofing cabinet for 90 min at 30°C, 85% relative humidity and baked at 250°C for 30 min

Table 1. *Bread Production formulation.*

Ingredient	A	B	C
Wheat flour	65%	-	100%
Soybean flour	15%	15%	-
Cassava flour	10%	10%	-
Corn flour	-	65%	-
Plantain flour	10%	10%	-
Water	120ml	200ml	110ml
Yeast	3g	3g	3g
Sugar	9g	9g	9g
Fat	3g	3g	3g
Salt	0.5g	0.5g	0.5g

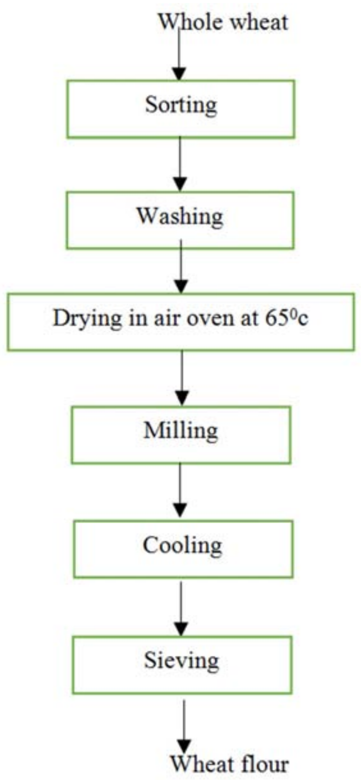

Figure 1. *Flow chart for the production wheat flour.*

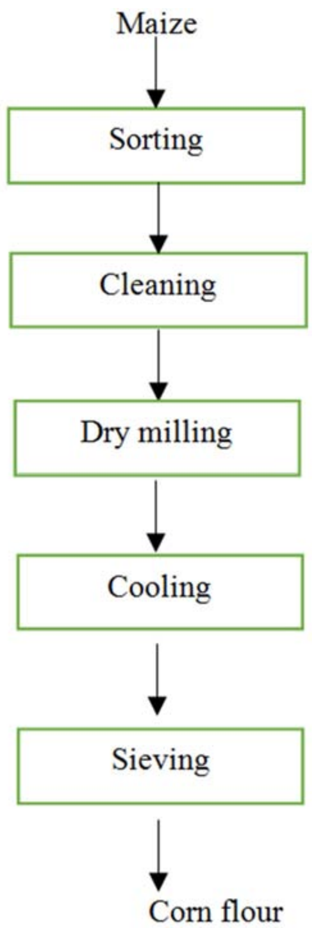

Figure 2. *Flow chart for the production of Corn flour.*

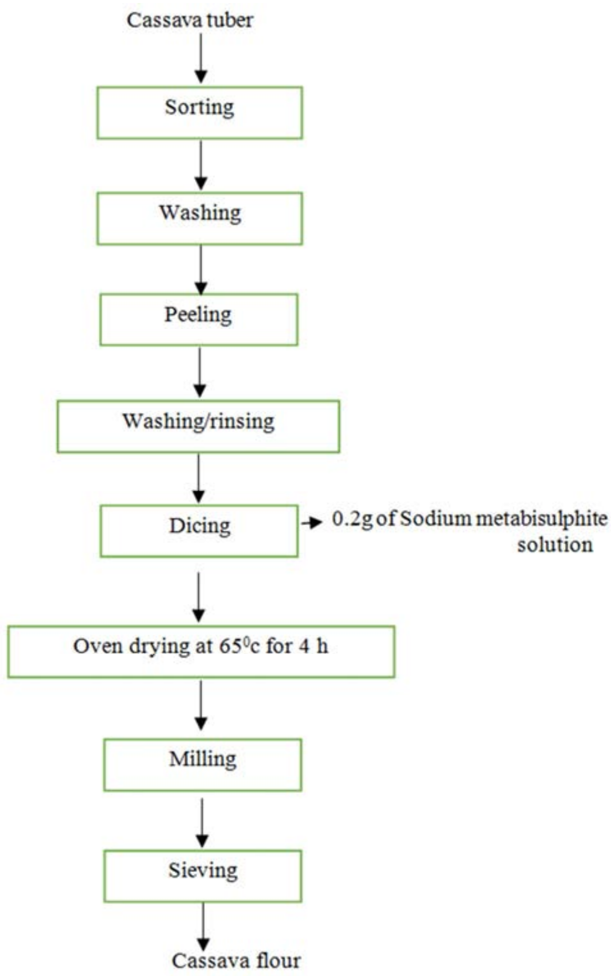

Figure 3. *Flow chart for the production of Cassava flour.*

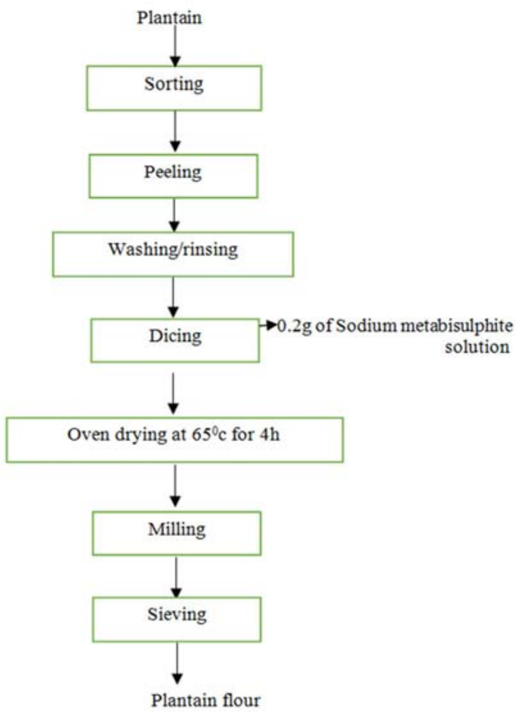

Figure 4. *Flow chart for the production of Plantain flour.*

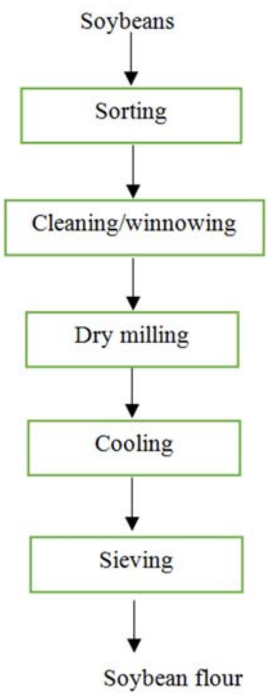

Figure 5. *Flow chart for the production of Soybean flour.*

2.5. Proximate Analysis

The proximate composition of the composite bread and the whole wheat bread samples were determined using the [18] methods. The samples were analyzed for moisture, ash, crude fibre crude protein, crude fat and carbohydrate (by difference).

2.6. Sensory Evaluation

The sensory attributes, including taste, colour, aroma, texture, appearance and overall acceptability were evaluated by a semi trained 15-member panel, using a 9-point Hedonic scale with 1 representing the least score (dislike extremely) and 9 the highest score (like extremely). Analysis of variance (ANOVA) was performed on the data gathered to determine differences, while the least significant test was used to detect significant differences among the means [17].

3. Result and Discussion

Tables 2 and 3show results of proximate composition and sensory attributes of the bread produced understudy.

Table 2. *Proximate analysis of composite bread.*

Parameter	A	B
Moisture (%)	9.28±0.11[b]	9.03±0.12[b]
Ash (%)	2.14±0.11[b]	1.81±0.15[a]
Protein (%)	11.00±0.13[b]	10.33±0.16[a]
Fat (%)	21.52±0.08[d]	20.65±0.22[c]
Crude Fibre (%)	9.25±0.12[d]	9.07±0.22[c]
CHO (%)	46.82±0.26[a]	49.10±0.09[b]

Keys: Sample: A = 65% wheat, 10% cassava, 10% plantain, 15% soybeans
Sample B = 65% corn, 10% cassava, 10% plantain, 15% soybean

Results obtained from the proximate analysis of both sample A and sample B as presented in table 2 showed that there was no significant difference (9< 0.05) in their moisture content. Although, the moisture content of each of the sample is still within the acceptable range of flour or flour products which is an indication of longer shelf life as reported by [16]. Ash content of sample A (2.14%) produced from 65% wheat flour; 10% plantain; 10% cassava; 15% soybeans was significantly higher than that of sample B (1.81%) made from 65% corn flour; 10% plantain; 10% cassava; 15% soybeans This could as a result of the high percentage of wheat and soybeans, since soybeans seeds have reported to contain appreciable amounts of minerals as reported by [19]. The protein content of bread with 65% wheat flour and soy supplemented were also noted to assume the same trend as the ash content. The protein content of sample A (11.00%) was higher than of sample B (10.33%). This could be as a result of the significantly quantity of protein in soybeans seeds [20, 21] and the protein (gluten) present in wheat flour. This high protein content in the soy supplemented bread would be of nutritional importance in most developing countries such as Nigeria, where many people can hardly afford high Proteinous foods because of the high cost. Higher value of fat content was noticed in sample A (21.52%); 65% wheat flour, 10% cassava flour, 10% plantain flour and 15% soybeans flour compare with the fat content of sample B (20.65%); 65% corn flour, 10% cassava flour, 10% plantain flour and 15% soybeans. Enrichment with 15% soy flour in sample A resulted in sharp increase in the fat content while the decrease in the fat content of sample B could be due to the percentage (10%) of cassava flour present and complete substitution of wheat flour with corn flour in the flour blends. Although, low fat sample will keep longer. The fibre content of sample A (9.25%) was significantly higher than that of sample A (9.07%). Although, the same level of soybean flour was present in both samples but the high fibre content in sample A may be due to higher dietary fibre in cassava flour and wheat flour, than in soybeans flour. Sample B (49.10%) had higher carbohydrate content than sample A (46.82%), Although lower when compare with the acceptable range of carbohydrate reported by [11]. The total carbohydrate content indicates that the flour blends used in producing the composite bread are classified as group of food energy supplier of nutritive and energy value which represent good source of enriched meal [11].

Table 3. *Sensory Evaluation of Composite Bread.*

Parameter	A	B	C
Appearance	5.53±1.25[a]	5.73±1.22[a]	7.73±1.03[b]
Taste	5.40±1.88[a]	6.13±1.41[a]	7.67±0.98[b]
Texture	6.27±1.28[a]	5.73±1.49[a]	7.60±0.99[b]
Aroma	5.33±1.79[a]	6.27±1.16[ab]	7.20±1.15[b]
Overall acceptability	5.80±1.37[a]	6.53±1.13[a]	7.87±1.13[b]

Keys: Sample: A = 65% wheat, 10% cassava, 10% plantain, 15% soybeans
Sample B = 65% corn, 10% cassava, 10% plantain, 15% soybean
Sample C = control (100% wheat)

From table 3, it could also be seen that the sensory attributes of the samples was significantly different from one another. The mean scores of the composite bread ranged from 5.53 to 7.73 for appearance; 5.40 to 7.67 for taste 5.73 to 7.60 for texture; 5.33 to 7.20 for aroma; 5.80 to 7.87 for overall acceptability respectively. It was evident from the results that the control sample was significantly (P>0.05) higher than the other two examples in term of the overall acceptability, although samples A and B were not significantly different from each other in all the sensory attributes. The high rate of control sample in appearance could be as a result of the Millard reaction (reaction between the sugar and the gluten (protein) in the wheat flour also known as browning reaction leading to attractive appearance and aroma since other samples are made from different flour blends. Control sample was rated best in term of texture, since 100% wheat flour was used, this could be attributed to the presence of gluten in wheat flour that resulted in the formation of elastic dough which was hard during handling and after baking. The control sample was also rated best in term of taste, since the acceptability of the bread recorded significant effect on taste; pleasant taste is the primary factor determining the acceptability of any product and has the highest impact in determining the market success of product. Also, control was best accepted by the judges in term of texture compare to others which were not significantly (p <0.05) different from each other. The unique baking property of 100% wheat flour has been well known to produce good texture product as reported by [17]. 100% wheat flour generally has a better baking quality than any other form of composite flour. In term of aroma, sample A was not significantly (P<50.05) different from the control. From the result obtained, the overall acceptability of the control was rated best compare with sample A and B. The lower carbohydrate content in the latter samples could be as a result of the abundant fat and the increased number of hydrophilic sites available due to protein that competes for the limited free water in dough during the composite bread production.

4. Conclusion

Bread of good nutritional and sensory qualities could be produced from a composite flour of wheat; cassava plantain flour substituted with 5-10% soybeans flour compare to that of the whole wheat bread. Bread produce from 65% wheat flour in place of corn flour shows a better nutritional composition such as protein. Since, higher level of soybean and wheat flour proportion increases the protein, fibre and fat content in composite flours, which are all desirable for good health and well being. It is recommended that up to 10% plantain flour and 5-10% soybean flour incorporation could be adopted in bread making processes without affecting quality adversely when compared with the 100% whole wheat flour. This will accrue in great saving in the scarce resources in most developing countries, where wheat cultivation does not thrive far due to climatic reasons.

References

[1] Mridula, D., Gupta, R. K. and Manikantan, M. R. (2007). Effect of incorporation of sorghum flour to wheat flour on Quality of Biscuit fortified with defatted soy flour. *America. Journal. Food Technol.*, 2(5): 428-434.

[2] Moore, M. M., Heinbockel, M., Dockery, P., Ulmer, H. M. and Arendt, E. K. (2006). Network formation in gluten-free bread with application of transglutaminase. Cereal Chemistry 83 (1): 28-36.

[3] Shittu, T. A., Raji, A. O. and Sanni, L. O. (2007). Bread from composite cassava wheat flour: Effect of baking time and temperature on some Physical Properties of Bread loaf. *Food Research International* 40: 280–290.

[4] Akubor, P. I, Ukwuru, M. U. (2005). Functional Properties and Biscuit Making Potential of Soybean and Cassava Flour Blends, *PlantsFoods for Human Nutrition,* 58: 1-12.

[5] Oladunmoye, O, R., Akinoso, R. and Olapade, A. A. (2010). Evaluation of some Physicochemical Properties of Wheat, Cassava, Maize and Cowpea flours or Bread making.

[6] Mongi, R. J., Ndabikunze, B. K., Chove, B., Mamiro, P., Ruhembe, C. C And Ntwenya, J. G. (2011). Proximate Composition, Bread Characteristics And Sensory Evaluation Of Cocoyam-Wheat Composite Breads. *Africa Journal of Food, Agric. Nutri. and Dev*. Volume 11(7) 16-24

[7] Halverson, J. and Zeleny, L. (1988). Criteria of wheat quality. In Wheat: *Chemistry and Technology*. Pomeranz, Y (ed.); vol. 1, P 15-45. *American Association of Cereal Chemistry*, St. Paul, Minnesota.

[8] Olaoye, O. A., Onilude A. A. and Idowu O. A. (2006). Quality Characteristics of Bread produced from composite flours of Wheat, Plantain and Soybeans. *African Journal Biotehnology* 11:1102-1106.

[9] Noor-Aziah, A. A and Komathi, C. A (2009). Acceptability attributes of crackers mode from different types of composite flour. International food research journal 16:479-482

[10] Abdelghafor, R. F., Mustapha, A. I., Ibrahim, A. M. H. and Krishnan, P. G. (2011). Quality of bread from composite flour of sorghum and hard white winter wheat. *Advanced Journal of Food Science and Technology,* 3(1):9-15.

[11] FAO (1998). Carbohydrates in Human Nutrition Food and Nutrition Rome. Paper 66

[12] Satin, M. (1988). Bread without wheat. In Maneepun, S., Varangon, P. and Phithakpol, B ed. Food Science and Food Agriculture 79:657-662.

[13] Juarez-Garcia E., Agama-Acevedo E., Sa´Yago-Ayerdi, S. G. and Rodri, S. L (2006). Composition, Digestibility and Application in Bread making of Banana Flour. *Plant Foods for Human Nutrition*; 61: 131–137.

[14] Dhingra, S and Jood, H. (2001). Organoleptic and Nutritional Evaluation of wheel Breads Supplemented with Soybean and Barley Breads Supplemented with Soybean and Barley flour. *Journal of food chemistry* 77:479-488.

[15] Sanfu, R. E. and Darko, S. (2010). Utilization of Soybean Flour in the production of bread. *Pakistan J. Nutr.*; 9(8):815-8.

[16] NRC (1989). National Research Council Recommended dietary Allowance 10th edition. National Academic press Washington D.C USA.

[17] Ihekoronye, A I and Ngodddy, P. P (1985). Integrated Food Science and Technology for the Tropics Macmillian publishers, New York 1985, Pp 296-301.

[18] AOAC (2010). Official Methods of Analysis, 20th ed. Washing D C: Association of Analytical Chemist.

[19] Plahar, W. A., Okezie, B. O. and Gyato, C. K. (2003). Estimated Protein quality of Weaning blends from Local Cereals and legumes in Sefa-Dedeh S. editon. The Development of high Protein-Energy Foods from Grainlegumes.

[20] Kure, O. A., Bahago, E. J. and Daniel, E. A. (1998). Studies on the proximate composition and effect of flour particle size of acceptability of biscuits produced from blends of soyabeans and plantain flours. *NamodaTech. Scope J*. 3(2): 17-22

[21] Basman, A., Koksel, H. and Ng P. K. W. (2003). Utilization of Transglutaminase use to increase the level of barley and soy flour incorporation in wheat flour Breads. *Journal of Food Science* 68 (8): 2453-2460.