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Physiochemical properties of composite maize-ogi almond flour blends

Abstract

In most African countries maize meal is a staple and a good complimentary and weaning diet for children. The purpose of this study was to determine the proximate, functional and sensory properties of composite blend flours of Ogi flour and almond flour. The two different flours from maize and almond groups were produced and blended at proportion of MF3 (95:5);MF2(90:10)MF1; (85:15) respectively. The moisture content, Crude protein, crude fiber, fat and ash content increased while carbohydrate decreased with decrease in percentage of almond flour. The swelling functional power increased with increased in temperature of the flour blends. But the water absorption capacity and the bulk density increased with increase in almond flour ratio. The sensory result showed acceptable formulation with blends. This study revealed that almond blending with maize ogi flour to get enriched Ogi is viable and the product is nutritional and healthy with bio benefits.

Keywords: ogi, maize, almond, functional proximate sensory quality

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Introduction

In developing countries in Africa, one major health problem encountered is the continent is malnutrition and hidden hunger. Ogi is one of their staple foods largely from cereal and nutritionally, ogi, is very rich in certain nutrients because it is a fermented food and has its major component as starch and however very low in nutrient after processing from loss.[1] The loss of nutrients is as a result of the bran and germ crushed and discarded. An effort to make the lost nutrients available is by employing fortification as a process.[2] This could be achieved by incorporating almond nut seed which is dense in bio-nutrient, rich in anti-oxidant protein and minerals especially calcium needed for the growth of teeth in children Palacios et al.[3] The formulation was done by adding 15, 10 and 5 % of the almond nut flour to the maize ogi flour in their dry forms. There are significant information on the production of cereals and legumes flour but there are little or no findings on the use of almond seed with Maize ogi for the production of composite food flour. Hence, the aim of this study was to formulate and assess the nutritional, functional and sensory properties of maize ogi-almond flour blends.

Materials and methods

Almond seeds were removed from its fruits, soaked in distilled water (1:6 w/v) dried and processed into flour while maize grains were steeped for 24hrs, sieved, slurry dried and packed as maize ogi.

Maize- Ogi production

Maize- Ogi was processed by adopting the method of 1:2 ration wet-milling described by Adeola.

Preparation of almond flour

The modified method of Kaur and Kapoor was adopted for almond nut flour produced using 1:6 w/v almond nut and water ratio for the soaking before drying.

Production of maize-ogi with almond nut

The maize ogi and almond flour were blended at proportion of 95:5; 90:10; 85:15.

Proximate result

The blends were subjected to various analysis such as Moisture, protein, fat, ash and crude fibre determination according to AOAC 2005.

Determination of functional properties of the flour blends

Bulk density

Using a method described by Nwosu,[4] the bulk density of the blends were determined

Water/oil absorption capacity

The AOAC, 2005 method was used for the determination of water absorption capacity of all blends.

Swelling capacity

The method of Singh and Anderson[5] with slight modification adopted for the determination of swelling capacity of the blends at three temperatures of 70°C, 80°C and 90°C.

Results and discussion

Proximate composition of maize ogi-almond nut blends

The determination of the proximate values reveals the nutritional adequacy of a product such as maize-ogi-almond nut blends. Table 1 showed the proximate values of ogi almond flour blends at varied ratios. The moisture content of blends ranged from 9.28 to 12.37% known to be good for flour. This makes the blends suitable for storage and transportation. The values obtained could be as a result of the process of dehydration in the cabinet dryer. At minimum level of 10-15% moisture produce could be within safe range for storage Adewole et al.[6] As the quantity of almond nut increased, the protein content of the flour also increased. Other proximate compositions such as fat, fibre, ash also increased with an exception for the carbohydrate content as the level of almond addition increased. The blend proportion of 85:15 had a significantly ($p<0.05$) high protein content of 22.07%.

Ogi flour not having almond nut flour included had the protein value of 2.18 % with the lowest value. The impact of almond nut addition obviously increased the bio nutrient of the composite flour. This result is expected since almond flour is rich source of protein. The total carbohydrate was significantly higher ($p<0.05$) for 100% maize ogi (84.33%) compared to the fortified blends. The values obtained for ash contents were between 1.19% to 1.24%. They are higher than the results obtained from the production of legumes fortified weaning food.[7] However, the values for ash contents are similar to the reports of Kanu et al.,[8] from porridge processed using sesame and pigeon peas. Sample blend of 85:15 had the highest content of ash at 1.24%, followed by 90:10 with, 1.22%, 95:5 had 1.19% and 100% maize ogi with 0.45%. This may be traced to the fact that almond nut flour has high organic content. Increase was noticed for crude fibre as the inclusion the protein flour increased. Crude fibre of the blends ranged between 7.48 % and 10.68%.For the values obtained for lipids, both 95:5 and 85:15 had 4.34 and 4.77%, respectively. These discoveries were noticed to agree with the work of Kolapo.[9] Also, the carbohydrate content decreased supporting the claims of Jimoh and Olatidoye.[10]

Table 1 Proximate composition of ogi-almond flour blends

Samples	Moisture %	Protein%	Lipids%	Ash%	Fiber%	Carbohydrate%
C1	9.28 ±0.08c	2.18±0.06c	0.98±0.07d	0.95±0.01d	2.28d	84.33±0.11
MAF3	10.10±0.05b	20.34±0.05d	4.34±0.02c	1.19±0.02b	7.48c	56.55±0.22b
MAF2	12.37±0.10a	22.07±0.01b	4.77±0.01c	1.27±0.01a	10.68b	53.33±0.27c
MAF1	13.37±0.10a	24.07±0.01b	5.77±0.01b	1.57±0.01a	11.68b	51.84±0.32d

Functional properties of the blends

The samples had similar functional properties. The bulk density value was 0.63% for all excluding sample 85:15 that had higher value of 0.67%. Bulk density is known to be a good indicator of relative volume of packaging material needed for food products. Generally, for easy dispersibility of food products and reduction of the thickness of paste for food produced for the sick and convalescent, higher bulk density is desirable.[11] The bulk density (Figure 1) is dependent on the sizes of the particle reduced during milling process. It could also be noted that there was an increase in water absorbed in (Figure 2) by the ogi-almond flour mixes which is reported as the water absorption capacity of the blends. The blend of 85:15 had (7.39%), sample 95:5 had 7.10% and sample 90:10 had 7.28% water absorption capacities respectively (Figure 2). Increase was noted as addition of the almond increased. Reason could be due to high starch digestibility. Samples were significantly different ($p<0.05$) in swelling capacity,(Figure 3) and the flour blend of 85:15 had the highest value in agreement with the report by Adebowale et al.[12] It was also observed in this study that as the temperature increased, the swelling power of the blends increased (Figure 3). Therefore, almond nut flour is a good thickener. The swelling power swelling power is a function of swelling of starch particles with time.[13] The swelling power ranged from 7.23 to 7.93 at 70°C, 8.28 to 8.45 at 80 oC and 8.44 to 8.54 at 90°C with 85:15 and 95:5 blends having the highest and least swelling power respectively.

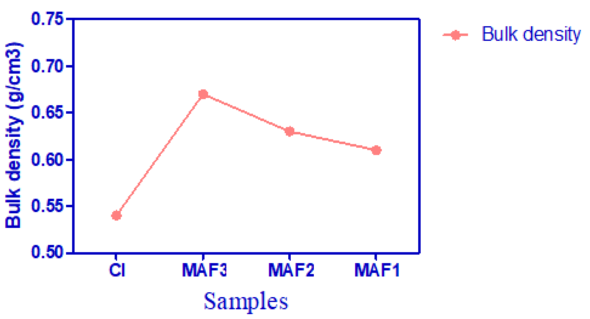

Figure 1 Bulk density of composite flour blends from ogi and almond flours.

Sensory evaluation

The scores rated for each sensory characteristics of the ogi-almond mixes are reported in Table 2 above. There was significant difference (<0.05) between mean sensory scores of the ogi-almond[14–17] in terms of the sensory parameters viz colour, taste, aroma, mouthfeel, acceptability. Colour is a main parameter which shows the suitability of the raw materials combined for the production and formulation of food. It also determines the quality of the food produced. However, MAF3 was most accepted. The variation is caused by almond flour which is responsible for the difference (>0.05) in the sensory attributes measured. ogi had high acceptance point in all the sensory parameters because people are familiar with its sensory characteristics. However, the blends produced provided maximum level of acceptance maybe due to protein and energy when consumed by infants.[18] Not only that, the good functionality of the blends will make easy for the blends to be stored, packaged and prepared with ease using hot water. In conclusion, almond flour above 10 % affected the sensory acceptability affected the product palatability.

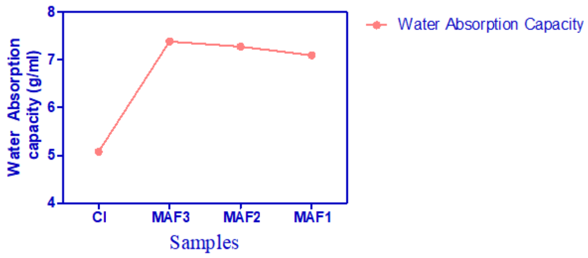

Figure 2 Water absorption capacity of composite flour blends from ogi and almond flours.

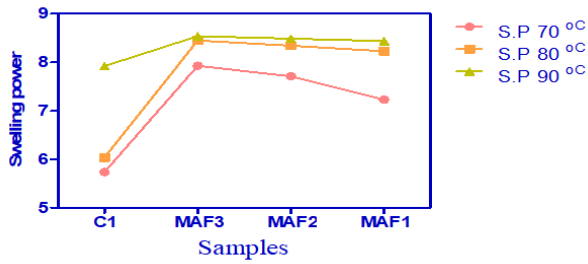

Figure 3 Swelling power of composite flour blends from ogi and almond flours.

Table 2 Mean sensory scores of Ogi from maize-ogi and almond nut flour blends

Samples	Colour	Mouthfeel	Aroma	Taste	Acceptability
C1	7.7a	7.9a	7.8a	7.9a	7.3a
MAF3	7.4b	7.7a	7.5b	7.6b	7.8b
MAF2	7.2c	7.3b	7.3b	7.4c	7.5c
MAF1	7.0d	7.2c	7.1c	7.3d	7.3d

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Conclusion

This study revealed that almond seed and maize compared favorably with traditional food (ogi) to meet the nutritional needs of children .The fortification also enhanced the physico-chemical properties of the Ogi/almond flour blends. This flour sample blend is preferred to the ogi flour samples due to blended higher chemical and acceptance level. However, there is need to check the biological load of the flour sample to ensure its safety for both infant and adult consumptions.

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Conflicts of interests

Authors declare no conflict of interests.

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