

PROXIMATE COMPOSITION AND SENSORY PROPERTIES OF SOY-PULP ENRICHED SHALLOW FRIED RICE MASA. - A TRADITIONAL NIGERIAN SNACK

Akeem Olayemi Raji and Salihu M.Baba.

Department of Food Science and Technology, Faculty of Agriculture, Kwara State University,
Malete, Ilorin, Nigeria.

*Corresponding author: [babasalihu628@gmail.com](mailto:babasali628@gmail.com)

ABSTRACT

This study was undertaken to investigate the nutrients composition of shallow fried masa from local (tapa: FARRO 52) rice and soy flour. Masa produced from this formulation using a standard processing method for masa. Proximate composition and sensory evaluation were analyzed on the masa samples using standard analytical procedures. The result of the proximate composition of the masa samples ranged between 12.53 – 15.99% for moisture content, 6.36 – 15.10% for protein content, 0.85 – 1.81% for ash content, 16.15 – 22.33% for fat content, 0.94 – 2.06% for crude fibre and 42.71 – 63.16% for carbohydrate content, respectively. The sensory evaluation of the masa samples showed sample B (90% local rice + 10% soy flour) as the highest value in term of overall acceptability of the sensory attributes. Thus, acceptable masa both nutritional and sensorial could be produced by addition of soy flour which will as well combat malnutrition and reduce the post-harvest loss of the soy pulp formally categorized as waste.

Keywords: Steeped corn flour, Soy pulp, Masa, Proximate composition, Sensory properties

1. INTRODUCTION

Masa is predominantly a carbohydrate-based food but low in protein quality (Ochoa- Martinez *et al.*, 2016). Like other cereal based food products, *masa* can be nutritionally fortified with the incorporation of other food substances. *Masa* is a yeast-fermented product which is round in shape, and is prepared in Nigeria and some other West African countries from the flour from millet, maize or rice flour (Ayo *et al.*, 2018). The product is cooked in a pan with individual cuplike depressions, and is consumed in various forms by all age groups in the Northern states of Nigeria, but less so in the Southern and Eastern States, except for few rural communities in South Western Nigeria where Northern immigrants are found. Common practice of partial drying of food products prior to deep-fat frying have beneficial effects by optimizing the moisture loss. Oil uptake during frying imparts desirable color and textural properties and supplies added nutrients to the fried food (Alimi *et al.*, 2013). Legumes are sources of low-cost dietary vegetable proteins and minerals when combine with animal products such as meat, fish and egg. Enrichment with locally available and cheap source of protein such as soybean will increase the amino acid balance (Adesokan *et al.*, 2011). Cereal is generally deficient in tryptophan and lysine which is abundant in legume. Moreover, the effect of deep-frying product during heat and mass transfer is scarce and has not been reported in detail to

explore the relationship between process variables and the quality characteristics of fried *masa*. This point has caught the attention of several researchers which also necessitate this study. This study aimed to determine the nutrients composition of soy pulp enriched shallow-fried Rice-*Masa*.

2. MATERIALS AND METHODS

2.1 Source of materials

Local/tapa white rice (Farro 52), soybean, baker's yeast, sodium bicarbonate (kanwa or trona), granulated sugar, salt, vegetable oil, onion and *masa* frying pan was purchased from Gbugbu, proposed international market, Edu, Kwara state, Nigeria

2.2 Methods

2.2.1 Production of rice flour

The method described by Akande *et al.* (2018) was used to produce rice flour. The rice obtained was sorted; cleaned and extraneous materials were removed before milling into flour. The milled rice flour was then sieved (60 μ m sieve mesh) and stored in polythene bags until when used.

2.2.2 Production of soybean flour

Soybean flour was prepared using the method described by Samuel *et al.* (2015) with slight modification. Soybean seeds was cleaned to remove extraneous materials and washed with cleaned water. The soybean was subject to boiling processing for 30 minutes and drained of boil-water. The boiled soybean and dried in the hot air oven at 50 °C for 12 h. The dried soybean coarse-milled to loosen the hull and then winnowed to remove the detached hulls. The dehulled seeds was milled (attrition mill) to obtained flour. The milled soybean was sieved passing through a (425 μ m) to obtain the millet fine flour which was stored in airtight plastic container at room temperature until needed.

2.2.3 Production of *Masa*

The *Masa* (*waina*) was produced according to the modified method of Samuel *et al.* (2015). Prepared rice and soybeans flour were weighed appropriately and mixed with 600 ml of cleaned water. The resulting batter was inoculated with baker's yeast and allowed to ferment for 2-4 h. The batter was diluted and mixed with trona (kanwa water) and then all other ingredient (sugar, salt, onion) were added to it. The batter was stirred vigorously with mortal or pestle to incorporate air and measure with medium size spoon and shallow pot was placed on fire. 3-5 ml of vegetable oil was added to the kasko *masa* pot and fried for 2 minutes on each side.

2.4 Proximate composition of *masa* samples

Proximate composition was analyzed according to the official method of analysis described by the Association of Official and Analytical Chemist (AOAC, 2012).

2.5 Sensory evaluation of the sample

Sensory evaluation was carried out on the samples of *masa* to assess for the attributes of taste, texture, colour, appearance, aroma, and overall acceptability. The *masa* samples was prepared and presented to twenty panelist mostly staff and students of the Department of Food Science and Technology, Kwara State University, Malete, Ilorin, Kwara State.

2.6 Statistical Analysis

The mean and standard deviations of the triplicate determinations of the proximate, mineral and sensory values were calculated. One-way analysis of variance was used to test for significant differences in the proximate, mineral and sensory properties of the *masa* samples.

3.0 RESULTS AND DISCUSSION

3.1 Proximate composition of *masa* samples

The results of the proximate composition of the *masa* samples are presented in Table 1. The results of the moisture content of the samples differed significantly ($p < 0.05$). The mean score value ranged from 12.53 - 15.99% with sample F (50% local rice + 50% soy flour) having the highest mean score value (15.99%) while sample A (100% local rice) had the least mean score value for moisture. This might suggest that soy pulp flour is hydroscopic in nature and had caused the increase of moisture in sample B - F. Lawrence (2022) also reported a similar increased in the moisture content of rice, maize, soybean *masa* samples. The results of the protein content of the *masa* samples ranged between 6.36 – 15.10% with sample F (50% local rice + 50% soy pulp flour) having the highest value of 15.10%. The least protein content of 6.36% was recorded for sample A (100% local rice). There was significant increase in the protein content of the *masa* samples as the substitution level of soy pulp flour increased. This could be due to the fact that soybean being a leguminous seed contained high amount of protein content. This is in accordance to the earlier observation of Ayo *et al.* (2008) for *Masa* produced from different Cereals. The results of the ash content of the *masa* samples different significantly ($p < 0.05$) from each other. The mean score values for ash ranged from 0.85 - 1.81%. Sample F (50% local rice + 50% soy pulp flour) had the highest ash content (1.81%) while sample A (100% local rice flour) had the least ash content (0.85%). The result obtained for ash content showed that the ash content in the whole rice *masa* samples was lower than the blended samples as same was observed in the study of Milkesa *et al.* (2021).

Table 1: Proximate composition of the *masa* samples

Samples	Moisture (%)	Protein (%)	Ash (%)	Fat (%)	Fibre (%)	CHO (%)
A	12.53±0.02 ^c	6.36±0.02 ^f	0.85±0.01 ^d	16.15±0.01 ^f	0.94±0.02 ^b	63.16±0.02 ^a
B	13.22±0.12 ^d	8.87±0.01 ^e	1.09±0.16 ^c	18.41±0.01 ^e	1.22±0.58 ^{ab}	57.20±0.52 ^b
C	13.86±0.01 ^c	10.56±0.01 ^d	1.10±0.02 ^c	18.87±0.01 ^d	2.00±0.01 ^a	53.61±0.11 ^c
D	14.90±0.60 ^b	12.54±0.02 ^c	1.91±0.01 ^a	20.20±0.02 ^c	1.55±0.57 ^{ab}	48.90±1.00 ^d
E	15.81±0.01 ^a	13.41±0.02 ^b	1.69±0.01 ^b	20.25±0.01 ^b	2.02±0.59 ^a	47.38±1.35 ^e
F	15.99±0.01 ^a	15.10±0.02 ^a	1.81±0.01 ^{ab}	22.33±0.0 ^a	2.06±0.40 ^a	42.71±0.36 ^f

Means score having the same alphabet along the same column are not significantly ($p < 0.05$) different, values are mean ± standard deviation of triplicate determination. CHO - Carbohydrate
Keys: A – 100% local rice, B – 90% local rice + 10% soy pulp flour, C – 80% local rice + 20% soy pulp flour

D – 70% local rice + 30% soy pulp flour, E – 60% local rice + 40% soy pulp flour, F – 50% local rice + 50% soy pulp flour

The results of the fat content of the *masa* samples ranged between 16.15 – 22.33% with sample F (50% local rice + 50% soy flour) having the highest fat content while sample A (100% local rice) had the least fat content of 16.15%. It was observed that the fat content of the enriched *masa* increased significantly as compared to the report of Akande *et al.* (2018). This could be as a result of fortification with soybean flour. Soybean which is rich in fat had fat content of 9% (Adegunwa *et al.*, 2017). The mean score value of the crude fibre content ranged from 0.94 - 2.06% with sample

F (50% local rice + 50% soy pulp flour) having the highest mean score value while sample A (100% local rice) had the least mean score value. It was observed that the blended rice showed that incorporation of soybean flour caused an increase in the fibre content of the blended sample. In a study conducted by Balogun *et al.* (2021) it was also reported that there was improvement in fibre content when rice flour was blended with bambara groundnut flour for instant *masa* flour. The mean score values for the carbohydrate contents ranged from 42.71 - 63.16% with sample A (100% local rice) having the highest mean score (63.16%) while sample F (50% local rice + 50% soy pulp flour) had the least mean score value (42.71%). From the result, it was observed that fortification with soy pulp flour brings about decrease in the carbohydrate content of blended flour samples as compared with the whole samples.

3.2 Sensory evaluation of the masa samples

There were significant differences in the sensory characteristics of the samples at 95% confidence level. Though, the taste of sample E had the highest mean score and followed by sample F, while samples A, B, C and D had the least mean score with the same value. Texture is a sensory attribute which is used to feel smoothness and roughness. In texture, there was no significant difference ($p > 0.05$) between each sample as compared to their control samples. Sample E had the highest value followed by sample F and sample A and C had the least value. In appearance, there was no significant difference ($p \leq 0.05$) between sample A and D, but sample A had the highest mean score value. There was significant difference ($p > 0.05$) between samples B and E and also there was significant difference ($p \leq 0.05$) between sample C and F, but of all the samples, sample E had the highest value and sample C had the least value. Appearance is the visual quality of the sample. There was significant difference between sample A and D. There was no significant difference between sample B and sample E and also there was significant difference between sample C and F. Sample E had the highest mean score. In aroma, there was no significant difference between each sample as compared to their base. Sample E had the highest value and sample A had the least value.

Table 2: Sensory evaluation of *masa* samples

Samples	Taste	Texture	Appearance	Aroma	Overall acceptability
A	6.20±0.79 ^b	6.20±0.79 ^a	7.20±0.92 ^{ab}	6.10±1.20 ^b	7.50±0.85 ^b
B	6.20±1.23 ^b	6.80±1.03 ^a	7.40±0.70 ^a	6.40±1.35 ^b	8.20±1.10 ^a
C	6.20±1.23 ^b	6.20±1.23 ^a	5.70±1.34 ^b	6.20±1.32 ^b	6.40±1.26 ^c
D	6.20±1.32 ^b	6.50±1.43 ^a	7.40±1.35 ^a	6.50±1.08 ^b	6.90±1.20 ^b
E	7.90±1.20 ^a	7.30±1.42 ^a	7.80±0.92 ^a	7.50±1.08 ^a	7.20±1.23 ^b
F	7.50±1.18 ^{ab}	7.00±1.05 ^a	7.00±1.49 ^{ab}	6.90±1.20 ^{ab}	7.10±0.88 ^b

Means score having the same alphabet along the same column are not significantly ($p < 0.05$) different, values are mean $\pm$ standard deviation of triplicate determination. Keys: A – 100% local rice, B – 90% local rice + 10% soy pulp flour, C – 80% local rice + 20% soy pulp flour, D – 70% local rice + 30% soy pulp flour, E – 60% local rice + 40% soy pulp flour, F – 50% local rice + 50% soy pulp flour.

For overall acceptability, it expresses the rate at which the panelists accept the samples. There was significant difference between sample A and sample D, but sample B had the highest value. Sample

B and sample E differed significantly, but sample E had the highest value. Sample C and sample F also differed significantly with sample F having the highest mean score.

Generally of all the samples, sample E had the highest mean score for overall acceptability.

4. CONCLUSION

The study assessed the potential of rice *masa* produced from rice and soy flour. The result obtained in this study showed that *masa* blending with soy flour improved the proximate composition of the *masa* samples. It was observed that 10% soy flour addition and whole rice *masa* sample was the most preferred by consumers, but nutritionally the enriched *masa* were more preferred. Thus, acceptable *masa* both nutritionally, sensorial could be produced by addition of soy flour, which will as well combat malnutrition and reduce the post-harvest loss of the soy formally categorized as waste.

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