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RESEARCH ARTICLE

Proximate Composition and Sensory Properties of Wheat-Maize Composite Flour Biscuits Enriched With Fermented Locust Beans *(Parkia biglobosa)*

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Abstract

The current economic situation in Nigeria demands the substitution of maize flour for wheat flour in pastries. Concern of health-conscious consumer for quality food led to the enrichment of this composite flour with nutritive and medicinal underutilize crop as *Parkia biglobosa*. Biscuits were produced from wheat-maize composite flours and enriched with fermented *Parkia biglobosa* flour (FPB). The proximate composition and sensory properties of the FPB enriched wheat-maize composite flour biscuit samples (A, B and C) was assessed. Data were subjected to descriptive statistics and analysis of variance (ANOVA) at $p < 0.05$. The proximate results of the biscuits samples ranged from 12.52 to 12.80% (moisture content), 3.15 to 3.28% (ash), 12.30 to 15.26% (fat), 2.63 to 4.21% (fibre), 10.37 to 13.26% (crude protein) and 53.00 to 57.05% (carbohydrate). The sensory evaluation results ranged between 5.30-6.40; 4.70-5.70; 4.70-5.90; 4.60-5.70; 4.82-5.87 for crispness, colour, aroma, taste and overall acceptability respectively. Sample C had least fat content, highest fibre and carbohydrate content and was most preferred for crispness, taste and overall acceptability. Significant ($p<0.05$) difference was observed for the moisture and carbohydrate content of the biscuit samples, while there were significant ($p<0.05$) differences among the sample means for crispness and colour.

Keywords: Parkia Biglobosa, Biscuits, Fermented, Maize Flour, Composite Flour.

1. Introduction

Biscuits are described as non-fermented aerated mix variety of flour confectionary products which are eaten as snack or dessert. They are low moisture content snacks comparatively free from microbial spoilage and thereby prolong their shelf- life (Zakari *et al.,* 2013; Adiza, 2020). They are classified either by the degree of fortification and processing or by the method adopted in shaping them (Zakari *et al*., 2013). Biscuits are produced from soft cereals wheat cultivated in many parts of the world but imported by countries with unfavorable climatic conditions.

Various composite flours had been developed from our indigenous food crop as wheat substitutes such as wheat-maize composite flour. Maize (*Zea mays*) has been reported to cover 24% of farmland in Nigeria. The statistics showed that 40% of crop produced in Nigeria are lost to post-harvest losses. Therefore, maize crops are used as composite flour to reduce postharvest losses. Maize is reported to have low protein (zein) and lack some essential amino acid; there is therefore need for fortification as health-conscious consumers demand for quality, organic and nutritious foods (Adiza, 2020).

Parkia biglobosa has been widely recognized as an important indigenous multipurpose fruit tree which can be utilize as food, medicine, manure, tannin, shade,

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bee food, stabilization of degraded environment, livestock feeds, fibre and several domestic uses (Musara *et al.,* 2020). Local underutilized crop such as locust beans (*Parkia biglobosa*) has been used in wheat biscuit fortification due to its medicinal attributes. The commonest use of locust beans seed is used as seasoning and condiment in cooking African dishes in countries such as Togo, Mali, Nigeria and Benin Republic (Ayo-Lawal *et al*., 2011). The fermented seed, which is called iru or dawadawa, is a popular condiment known to be rich in protein and vitamins. The condiment is obtained from seeds ofm *Parkia biglobosa* that have been washed, de-hulled, fermented and molded into balls (Akande *et al*., 2010). Processing into iru is majorly done traditionally with rudiment technology in the processing line which is time-consuming and labour-intensive (Adejumo *et al.,* 2013). There is a presence of mineral components in fermented *Parkia biglobosa* such as calcium, iron, magnesium, sodium, copper, potassium, phosphorus, manganese and zinc have been reported by Ogunyinka *et al. (*2017). It is a good source of macronutrient, vitamins A and C and carotenoids (Dahouenon-Ahoussi *et al.,* 2012).

Therefore, the objective of this study is to produce biscuit from wheat-maize composite flour enriched with *Parkia biglobosa* flour, which encourage its increased utilization and to evaluate the proximate and sensory properties of the developed sample.

2. Materials and Methods

2.1 Materials

Wheat and maize grains, fermented *Parkia biglobosa*, baking powder and other baking ingredients were purchased from Oja-Oba market, Ado-Ekiti. The experiment was carried out in the processing laboratory in the Department of Food Technology, Federal Polytechnic, Ado-Ekiti.

2.2 Sample Preparation

Wheat flour and maize flour were produced with a method described by (Onuegbu *et al.,* 2013) and Idowu *et al.,* 2021) method was adapted in production of fermented *Parkia biglobosa* flour. The biscuit samples were produced based on the modified method described by (Ihekoronye 2008).

2.3 Proximate Analysis

The standard procedure of Association of Official Analytical Chemist International (AOAC, 2009) was used for the analysis of moisture content, ash, fat, protein, fibre and carbohydrate of the biscuit samples produced.

2.4 Sensory Evaluation

Biscuit samples were evaluated with nine-point hedonic scale. Students and staffs of the department of Food Technology were used as taste panelists.

2.5 Statistical Analysis

All analyses were carried out in triplicates and mean values were recorded as data obtained. Data obtained were analyzed using ANOVA at $p<0.05$. Means were separated using Turkey's test in SARS statistical package.

3. Results and Discussion

3.1 Proximate Compositions of the Enriched and Control Biscuit Samples

The proximate composition of the enriched biscuit samples and control are presented in Table 1. The moisture content of the enriched biscuit samples (A, B and C) ranges between 12.52 to 12.80%, sample C had the highest value followed by sample A while sample B had the lowest moisture content. The lower the moisture contents of a product, the longer the potential storage life of the product. It is believed that materials such as flour and starch containing more than 12% moisture have less storage stability than those with lower moisture content, for this reason, a water content of 10% is generally specified for flours and other related products (Eddy et al., 2007).

Mammad (2007) reported that the moisture content of biscuit sample should not exceed 14% and 16%. The result of the moisture content of the biscuit enriched with *Parkia biglobosa* is in line with the findings of Onuegbu *et al.,* (2013) who reported (14-16%) moisture content. There were significant differences ($p< 0.05$) between the moisture content of the biscuit samples. The mean value of the ash content of the sample ranges from 3.15 to 3.28% Sample A (control) has the highest ash content and the lowest value was observed in sample B. The fat content ranges between 12.30 to 15.26%, sample A had the highest value and the lowest was observed in sample C. The fibre content ranged between 2.63 to 4.21%, sample A had the lowest fibre content and sample C had the highest content this may be as a result of the inclusion level of the fermented *Parkia biglobosa* powder in the biscuit. The protein content ranged from 10.37 to 13.26%. Sample C had the highest protein content while sample A had the lowest value.

The carbohydrate content of the sample was within the range of 53.00 to 57.05%. Sample C had the highest while sample A had the lowest value. There were significant differences between the carbohydrate content of the flour sample at ($p< 0.05$). It was observed that protein, carbohydrate and fibre content of the biscuits increases as the *Parkia biglobosa* content increases in the sample while fat content decreases The results of the values obtained for ash content is a pointer to the quality of their mineral constituents. The increase in protein content is as a result of addition of fermented *Parkia biglobosa* flour in the biscuit production compared to the lower content reported by Adanse *et al.,* (2020). Dietary fibre also has lot of health benefits implications in the prevention of some health threatening diseases.

Table 1. *Proximate composition of wheat-maize composite flour biscuit enriched with fermented Pakia biglobosa (locust beans)*

Sample	Moisture Content	Ash	Fat	Fibre	Protein	Carbohydrate
A	12.64±0.02^{ab}	3.28±0.02^{a}	15.26±0.02^{a}	2.63±0.01^{b}	10..37±0.01^{a}	53.00±0.00^{c}
B	12.52±0.01^{b}	3.15±0.04^{b}	14.82±0.02^{b}	2.82±0.00^{b}	11.14±0.04^{b}	55.50±0.02^{d}
C	12.80±0.01^{a}	3.22±0.00^{a}	12.30±0.05^{c}	4.21±0.00^{a}	13.26±0.01^{bc}	57.05±0.01^{c}

Means in a column with the same superscripts are not significantly different from one another ($p< 0.05$)

Sample A= 60% wheat, 40% maize (Control);

Sample B= 70% wheat, 20% maize, 10% fermented Parkia biglobosa; (10% FPB)

Sample C= 75% wheat, 10%maize, 15% fermented Parkia biglobosa. (15% FPB)

3.2 Sensory Analysis of Enriched and Control Biscuit Samples

The mean score values of the sensory attributes of the biscuits in terms of crispness, color, aroma, taste and overall acceptability ranged between 5.30-6.40; 4.70-5.70; 4.70-5.90; 4.60-5.70; 4.82-5.87 respectively (Table 2). There were no significant difference in the parameters ($p<0.05$) for the aroma, taste and overall acceptability of the biscuits samples. Sample C had the highest score for crispness, taste and overall acceptability; while sample A had the highest score for aroma, showing sample A is the control sample. The enrichment of the biscuit with fermented *Parkia biglobosa* leads to increase in the score values of taste, color, aroma and overall acceptability of the enriched biscuit. The mean score of the sample C was the highest (5.87) and most preferred followed by sample B (5.60) compared with sample A. This is contrary to the result of Adanse *et al.,* (2020) where only 100% wheat biscuit was mostly preferred by the panelists for all the parameters.

Table 2. *Sensory Attributes of the wheat-maize composite flour biscuit enriched with fermented Pakia biglobosa (locust beans)*

Sample	Crispness	Color	Aroma	Taste	Overall Acceptability
A	5.30±0.49^{de}	4.70±0.63^{c}	5.90±0.49^{d}	4.60±0.54^{d}	4.82±0.44^{d}
B	5.70±0.26^{d}	5.70±0.49^{bc}	5.80±0.41^{c}	5.5±0.37^{cd}	5.60±0.28^{cd}
C	5.70±0.26^{d}	5.70±0.49^{bc}	5.80±0.41^{c}	5.5±0.37^{cd}	5.60±0.28^{cd}
	6.40±0.22^{cd}	5.50±0.47^{c}	4.70±0.31^{bc}	5.70±0.30^{cd}	5.87±0.25^{c}

Means in a column with the same superscripts are not significantly different from one another ($p< 0.05$)

Sample A= 60% wheat, 40% maize (Control);

Sample B= 70%wheat, 20% maize, 10% fermented Parkia biglobosa; (10% FPB)

Sample C= 75% wheat, 10%maize, 15% fermented Parkia biglobosa. (15% FPB)

4. Conclusion

This study revealed that the sample C with 15% FPB had the desired lowest fat content, higher protein, highest fibre and carbohydrate content. The same sample C was most preferred for crispness, taste and overall acceptability. It can be concluded that the enriched biscuits with fermented *Parkia biglobosa* had improved nutrient composition (protein, ash and fibre), and had great potentials having lots of health benefits on the consumers.

Conflict of Interest

The authors declare that they have no conflict of interest.

5. References

1. Adanse, J., Atingah, C. A. & Kodua, E. (2020). Proximate and Consumer Acceptability of
2. Biscuits Produced From a Blend of Wheat and Local Sweet Potato Flour. *International Journal Academic Applied Research*, 4 (6), 7-16.
3. Adejumo, A.A., Azeez, I.O., Geply, J.J. & Oboite; F.O. (2013). Processing, utilization and challenges of African locust bean (Parkia biglobosa, Jacque Benth) in Arigidi Akoko, Ondo State, Nigeria. Journal of Agriculture and Social Research, 13, 39.
4. Adiza, S. (2020). The Efficacy of African Locust Beans in the Production of Shortbread Biscuits. *Euopean. Journal Food Science Technology,* 8(4), 36-45.
5. AOAC. (2009). Official methods of analysis of association of official analytical chemists. Washington, DC (17th ed.). Washington, DC.
6. Akande, F. B., O. A., Adamade C. A. & Bodunde J. (2010). Processing of locust bean fruits: Challenges and prospects .African Journal of Agricultural Research, 5(17), 2268-2271.
7. Ayo-Lawal, R. A., Sibuyi, N. R., Ekpo, O., Meyer, M. & Osoniyi, O. (2021). Investigation of the anti-cancer and apoptotic properties of aqueous extract from fermented African locust bean seeds. *Food Research* 5 (1), 203 – 210.
8. Dahouenon-Ahoussi, E., Adjou, E.S., Lozes, E., Yehouenou, L.L., Hounye, R., Famy, N., Soumanou, M.M & Sohounhloue, D.C.K. (2012). Nutritional and microbiological characterization of pulp powder of locust bean (Parkia biglobosa Benth.) used as a supplement in infant feeding in Northern Benin. African Journal of Food Science, 6(9), 232-238.
9. Eddy N.O., Udofia P.G. & Eyo D. (2007). Sensory evaluation of wheat/cassava composite bread and effect of label information on acceptance and preference. *Journal of Biotechnology*, 6: 2415-2418.
10. Idowu, D. O., Olaniran, J. A. & Onifade, T. B. (2021). Effect of drying temperature on physical properties of fermented dried locust bean flour. *Journal of Agriculture and Crop Research*, 9 (1), 1-7.
11. Ihekonronye A. (2008). Manual on small-scale food processing 1st ED, Academic publishers Nsukka. P.32
12. Musara, C., Aladejana, E. B., Mudyiwa, S. M. & Karavina, C. (2020). *Parkia biglobosa* (Mimosaceae): Botany, Uses, Phytochemical Properties and Pharmacological Potential. *Journal Pharmaceutical and Nutrition Science*, 10 (3), 101-115.
13. Ogunyinka, B.I., Oyinloye, B.E., Osunsanmi, F.O., Kappo, A.P. & Opoku, A.R. (2017). Comparative study on proximate, functional, mineral, and antinutrient composition of fermented, defatted, and protein isolate of Parkia biglobosa seed. Food Science and Nutrition, 5(1), 139–147.
14. Onuegbu N. C., Ihediohanma N. C., Odunze O. F & Ojukwu M. (2013). Efficiency of wheat: maize composite flour as affected by baking method in bread and cake production. *Sky Journal Food Science* 2(8), 005 – 013.
15. Zakari, U.M., Ajayi, S.A. & Hassan, A. (2013). Effect of Locust Bean Fruit pulp (*Parkia biglobosa*) Flour on the quality of wheat biscuits. *Journal of Agricultural Biotechnology Sustainable Development*, 5(6), 99-102.