

Proximate Analysis of Millet Flour, Baobab Pulp Powder and Moringa Leaf Powder

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Abstract

This study examined the proximate analysis of millet flour, baobab fruit pulp and moringa leaf powder. Experimental design was employed for this study. Samples of millet flour, baobab pulp powder and moringa leaf powder were prepared in three different ratios 90:7:3(MBM₁), 80:13:7 (MBM₂) and 70:19:11(MBM₃) respectively. Proximate analysis, mineral composition, and vitamin content were also carried out. The results showed that moisture values ranges from 9.10 - 10.11, ash values ranges from 0.97 - 2.56, fiber ranges from 2.29 - 2.42, protein ranges from 1.69 - 3.5, fat ranges from 1.42 - 2.00; Ca values ranges from 0.0451 - 0.0628, P values ranges from 0.005 - 0.009, Fe values ranges from 0.0457 - 0.1588 and Zn values ranges from 0.0235 - 0.0273; Vitamin C values 0.0442 - 0.142. The proximate analysis conducted revealed that the blended samples had increase in proximate composition since the p Value of 0.305, 0.145 and 0.400 for the different ratios of the blends were greater than the 0.05 significance level. Likewise, the mineral composition was also seen to increase in the blended samples but no significant difference was established as the p Values of 0.35, 0.228 and 0.196 were greater than the 0.05 significance level.

Keywords: Poor nutrition, Nutritious feed, Baobab pulp, Health Initiative, blends of millet flour

Introduction

The importance of nutrition as a foundation for healthy intellectual development is underestimated in Nigeria. Poor nutrition leads to ill health, and ill health causes further deterioration in nutritional status. In 1995, the World Health Organisation's Global School Health Initiative was launched with the mandate to see schools as means of strengthening health promotion and education activities at local, national, regional and global levels, thereby improving the health of students, families, and all members of the community. In the realization of the central role of nutrition to education, healthy eating habits ought to be introduced in the life of humans which can play a vital role in their mental and physical development

and also promote growth and reduce many risks associated with both immediate and long-term health problems, (WHO 2006).

Nutritious feeding is the foundation of growth and development, but in many homes the idea of proper feeding is still a dream. Experts argue that poor feeding affects academic abilities of human beings. In some government boarding schools in Nigeria, students feeding are so poor that some parents prefer sending their children to Day schools where the students can be feeding at home. In Nigeria, most government boarding secondary schools are facing serious problems of food insecurity. In most schools the nature of what is being taken as a meal is poor; maize flour for example

is prepared as pap with little or no sugar added for students to take as breakfast. Sometimes the cereal used for the breakfast is infested by weevils and care will not be taken to remove the weevils, it is ground to prepare breakfast for the students. This is likely to be the reason why some of the students look malnourished, sometimes very thin in appearance and due to this a lot of the secondary school adolescents that would have been great men and women were lost. Most students after taking this kind of breakfast fall asleep in the class while lessons are going on. Because of this, the students performed poorly at the end of the day leaving parents, guardians and sometimes the government regretting. Despite the large production of millet, baobab pulp powder, and moringa leaf powder in Nigeria, a lot of people do not know how to feed well on them. Millets are produced in large quantity annually, and if recipes are adapted using millets, baobab pulp powder and moringa leaf powder, it will create room for diversification thus providing nutrients needed by the body.

Baobab pulp powder has not been utilized optimally due to lack of knowledge and product development, despite its availability and nutritional values. In recent time moringa has become the business of the day. Several researches have shown the importance of moringa for food and medicinal purposes. However, not much work has been done on improving consumers' acceptability of the blend of millet, baobab pulp powder, and moringa leaf powder to improve the diet of consumers.

This study therefore, sought to look at the proximate analysis, mineral composition and vitamin content of the blends of millet flour, baobab pulp powder and moringa leaf powder.

Objective of the Study

The major purpose of the study was to evaluate the proximate composition, mineral composition, vitamin composition of Millet flour with Baobab pulp powder and Moringa leaf powder. Specifically, the objectives are:

1. Determine the proximate compositions (moisture, fat, protein and carbohydrate) of the sample of Millet flour blended with Baobab pulp powder and Moringa leaf powder.
2. Determine the mineral composition (calcium, magnesium, sodium, potassium, iron, zinc and phosphorus) of millet flour blended with Baobab pulp powder and Moringa leaf powder.
3. Determine the vitamin composition of the sample of millet flour, blended with Baobab pulp powder and Moringa leaf powder.

Methodology

The data collected in this study was analysed using descriptive and inferential statistics, specifically mean was used to answer the research questions and the hypotheses formulated in the study were tested with the use of analysis of variance (ANOVA) this provides the basis for rejecting or accepting the stated hypotheses at 0.05 significance level.

The p-values were used to determine either to accept or reject the hypothesis formulated in the study, the hypotheses were rejected on the basis that the p-value < 0.05 significance level and accepted on the basis that the p-value > 0.05 significance level.

Table 1: The proximate composition of the different blended ratio of millet flour, baobab pulp powder and moringa leaf powder

Proximate analysis	% Moisture	% Ash	% Fibre	% Protein	% Fat	% Cho
MBM₁	9.10	0.97	2.42	3.50	2.00	82.01
MBM₂	8.59	1.72	2.54	2.69	1.42	82.91
MBM₃	10.11	2.56	2.29	1.69	1.47	81.88

Key: MBM₁- 90:7:3, MBM₂-80:13:7; MBM₃ - 70:19:11 Millet flour, Baobab pulp and Moringa leaf oleifera powder

The table presents the percentage of the proximate composition of the Millet flour and the different ratio of the blended samples of Millet flour, Baobab pulp and Moringa leaf oleifera. The blended samples named MBM₁ which contains the Millet flour, Baobab Pulp and Moringa leaf oleifera in the ratio of 90:7:3 has the proximate composition of moisture 9.10%, ash 0.97%, fibre 2.42%, protein 3.50%, fat 2.00% and CHO 82.01%. The blended sample 3 (MBM₂) which contains the Millet flour, Baobab pulp and Moringa leaf oleifera in the ration of 80:13:7 has the

proximate composition of moisture 8.59%, ash 1.72%, fibre 2.54% protein 2.69% fats 1.42% and CHO 82.91%. The blended sample 3 (MBM₃) contains the Millet flour, Baobab pulp and moringa leaf oleifera in the ratio of 70:19:11 has the proximate composition of moisture 10.11%, ash 2.56%, fibre 2.29%, protein 1.69%, fats 1.47% and CHO 81.88%. It was observed that the blended samples which were fortified by the Baobab pulp and Moringa oleifera have higher proximate composition.

Table 2: Mineral Composition of blends Samples measure in (mg/kg)

Mineral Content	MBM ₁	MBM ₂	MBM ₃
Na	1.0717	1.0293	0.9482
K	0.4493	2.7174	0.7759
Ca	0.0520	0.0451	0.0628
P	0.009	0.005	0.070
Mg	0.0414	0.0432	0.0629
Fe	0.1585	0.0868	0.0459
Zn	0.0235	0.0273	0.0240

Key: MBM₁--90:7:3, MBM₂ -80:13:7; MBM₃ - 70:19:11 Millet flour, Baobab pulp and Moringa leaf oleifera powders. BDL means (Below Detection Limit).

The table presents the mineral composition in the ratio of 90:7:3 for MBM₁, 80:13:7 for MBM₂ and 70:19:11 for MBM₃. It was observed that the blended samples contain more of the mineral

content. The mineral content Na is in proportion of 0.0451, 1.0717, 1.0293 and 0.9482, MBM₁, MBM₂, and MBM₃ respectively. The mineral content in K was in the proportion of 0.0275, 0.4493, 2.7174

and 0.7759 for the blends samples respectively. The mineral content in Ca has 0.0488, 0.0520, 0.451 and 0.0628 for the respective blends samples respectively. The mineral content in P was in proportion of 0.004, 0.009, 0.005 and 0.070 for the three blends samples respectively. Also, the mineral content in Mg was in the proportion of 0.0263, 0.0414, 0.0432 and 0.0629 for the blends samples respectively. The mineral content in Fe was in

proportion of -0.0347 BDL, 0.1585, 0.0868 and 0.0459 for the control first and the blends samples respectively. The mineral content in Zn was in proportion of 0.0005, 0.0235, 0.0273 and 0.0240 for MBM₁, MBM₂, MBM₃, respectively. Therefore, it can be said that the Millet flour fortified with Baobab pulp and the Moringa leaf oleifera in different ratios has improved mineral composition for the blends.

Table 3: Vitamin composition of millet flour, baobab pulp and moringa leaf powder

Samples (mg/l)	VIT A	VIT B1	VIT C	VIT E
MBM₁	0.036	8.769	0.142	0.778
MBM₂	0.058	12.709	0.044	5.340
MBM₃	0.162	12.697	0.060	0.615

Key: MBM₁- 90:7:3, MBM₂-80:13:7; MBM₃ - 70:19:11 Millet flour, Baobab pulp and Moringa leaf oleifera powder

The table presents the vitamins composition of the blended sample (MBM₁, MBM₂ and MBM₃) of Millet flour, Baobab pulp and Moringa oleifera powders the vitamins composition presents are Vitamin A, Vitamin B1, Vitamin C and Vitamin E based on the analysis. MBM₁, blended formation of Millet flour, Baobab pulp powder and the Moringa leaf oleifera in the ratio of 90:7:3 had 0.036, 8.769, 0.142, and 0.778 of the vitamins A, B1, C and E composition respectively. Similarly, the other blended formation which is MBM₂ in the ratio of 80:13:7 had the vitamins A, B1, C and E composition of 0.058, 12.709, 0.044, and 5.340 respectively while the MBM₃ in the ratio of 70:19:11 had vitamin composition in proportion of 0.162, 12.697, 0.060 and 0.615 respectively. This implies that the blended samples contain some proportion of vitamins in them as presented in the analysis.

Discussion of the Findings

The research question one revealed that the blend samples showed no significant difference in proximate composition. This may be attributed to the low level of supplementation ratio of baobab fruit pulp and moringa leaves powder in the blends. However, sample MBM₃ showed highest values of moisture and ash contents compared to other samples. High moisture content might not be good for storage life of the products. On the other hand, high ash content might signify high numerals content. Similar results have been reported by Abioye (2005) with increased minerals content in moringa leaves fortified yellow-maize Ogi. MBM₃ recorded highest values for fibre content compared to other samples. Though crude fibre does not contribute nutrients to the body, it adds bulk to food thus facilitate bowel movements and prevent many gastrointestinal disease (Gordon,

1999). MBM₂ had highest content values for protein and fats compared to other samples. The results of this study corroborate with the findings of Adebayo et al (2010) who reported lower protein values in amala fortified with moringa leaf powder. It also disagrees with Kushwha, Chawla and Pant (2013) who reported significant increase in protein and fat content of *missiroti* and *chapatti* with 15% supplementation of drumstick leaves. Proteins are essential constituents of all body tissues which help the body to produce new tissues. Highest carbohydrate and energy values were found in MBM1 compared to other blend samples. Carbohydrate provides heat and energy for all forms of body activity. At the recommended daily allowance of 3000 kcal for normal adult human (Gamman and Sherrington, 1990), blends of millet powder, baobab fruit pulp and moringa leaf powder could provide adequate energy for daily human sustenance.

The research question two revealed that the minerals composition of different blends of millet powder, baobab fruit pulp and moringa leaf powder samples resulted in no significant difference in the mineral composition of the three samples. Sodium and iron values decreased with increased supplementation ratio. The result of this study disagreed with the report of Abioye (2015) who stated that increasing the supplementation ratio of moringa leaf increases the values of mineral content of yellow -maize ogi sample. Iron is a vital component of red blood cells which carry oxygen and makes body more resistant to infection. Supplementation of baobab fruit pulp and moringa leaf powder could provide Fe needs going by RDA of 5 - 9.00mg (WHO, 2001). Calcium and potassium values increase with increasing supplementation but not significantly different. The result corroborates with the findings of Kachhawa and Chawla (2017)

who reported significant improvement in calcium content with increasing supplementation of moringa leaf pancake and *daliaas* compare to control. A supplementation of baobab fruit pulp and moringa leaf powder could meet some percentage of calcium needs based on the RDA of 0.60 - 0.70g (Gamman and Sherrington, 1990). However, Phosphorus, magnesium and zinc values incremental rate did not follow a definite trend; this may be attributable to low level of supplementation ratio.

Research question 3 showed that the blends of millet powder, baobab pulp and moringa leaf powder contained vitamins content of A, B₁, C and E. There no significant difference observed in the different samples of the blends. But, there was an increase in the vitamin content as the blending of the sample increased mostly observed in vitamin B₁ content.

The result corroborates the higher vitamin C content reported in Ogi supplemented with baobab fruit pulp in (Adejuyitun et al., 2012). Kachhawa and Chawla (2017) that reported maximum increase in ascorbic acid content in pancake supplemented with moringa leaf. Vitamin C is necessary for healthy development of bones, teeth and blood, and sex organ. The vitamin C content in the blend samples could provide some percentage going by the RDA of 30mg. Thiamine (B1) is an essential nutrient that all tissues of the body need to function properly. Like other B vitamins, thiamine is water-soluble and helps the body turn food into energy. Vitamin B1 values increase with increasing supplementation ratio. This implies that both components used in the supplementation are good sources of vitamin B1. Vitamin E is an essential nutrient that the body needs to function properly. Vitamin E (tocopherol) is fat -

soluble which help prevent oxidative stress to the body. The values vary with supplementation levels, however lack concurrent trend.

Conclusion and Recommendation

Baobab fruit pulp and moringa leaf powder are cost effective and easily available plant parts. Incorporation of baobab fruit pulp and moringa leaf powder at 13:7 (20%) in traditional breakfast recipes, enhance the mineral and vitamin content of preparations. Based on the findings and conclusion, it was recommended that:

1. Supplementation of baobab fruit pulp and moringa leaf powder into organoleptically acceptable commonly consumed breakfast recipes would be suitable to improve the nutritional composition of traditional recipes and enhance dietary diversification and micronutrients.

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