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Evaluation of Sensory Attributes of Snack from Maize-Moringa Seed Flour Blends

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Abstract**—**Healthy snack (cookie) was produced from corn flour and moringa seed flour blends. The samples were mixed in various proportions and analysed for proximate composition and functional characteristics. The healthy snack (cookies) was evaluated for sensory parameters of Colour, Crispness, Taste, Aroma and Overall Acceptability. The proximate analysis of the flour obtained from different proportion showed that proximate composition increased with increase in substitution level of moringa seed flour especially with protein, fat and crude fibre. The protein contents of samples range from 1.75 to 6.58, fat from 0.60 to 6.80, while fibre from 0.85 to 2.06. There was no significance difference in the functional properties of the blend when compared with 100% corn flour. Sensory evaluation results shows a significant difference in Colour, Taste, Crispness, Aroma and Overall Acceptability of healthy snack (cookies) sample from different blends at 5% significance level.

Keywords**—**Healthy snack, moringa.

I. Introduction

MAIZE *(Zea mays)* is one of the major cereals to have become staple food and contribute to constituent of our daily diet in Africa and in most developed countries of Asia and Latin America consumed by man as food, as animal feed and industrial raw materials. The traditional role as vitamins and minerals source is secondary to their role as energy supplier [1].

Moringa oleifera is considered as one of the world's most useful trees, as almost every part of it can be used for food or has some other beneficiary property [2].

The parts (leaves, fruit, flower, and immature pods) are edible and form part of traditional diet in many countries of the tropics and sub-tropics [3].

Moringa oleifera will be one of the alternatives to most imported food supplies to treat malnutrition. The diet of many rural and urban dwellers is deficient in protein and high in carbohydrate. Moringa seeds contain more vitamin A than carrots, more calcium than milk, more vitamin C than oranges, and more potassium than bananas, 4 times the fibre in oats, 9 times the iron in spinach, and that the protein quality rivals that of milk and eggs [4].

Since maize flour is mainly rich in carbohydrate, there is need to improve the nutritional status of products made from it. The fortification of maize flour with moringa seed flour has received considerable attention [5].

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This report describes a processing method of milling maize into flour and fortifying it with *Moringa oleifera* seed flour for the production of nutritive snack (cookies) and subjected to sensory evaluation.

II. Materials and Methodology

A. Materials

Yellow dent maize was purchased in Alasalatu market, Mushin, Lagos, while *Moringa oleifera* was purchased in Sokoto main market, Sokoto State, both in Nigeria.

Fig. 1 Yellow dent maize

Fig. 2 Maize/Moringa flours snack

Fig. 3 Moringa Oleifera Seeds

B. Methodology

The maize flour was prepared according to the method described by [6], while the moringa flour was prepared according to [1].

Then the maize flour and *Moringa oleifera*'s seed flour was manually blended together at ratios 97.5: 2.5; 95: 5; 92.5: 7.5 respectively using 100 percent maize flour as reference.

III. Analysis

Moisture Content, Protein Content, Ash Content and Carbohydrate Content, were carried out according to the standard methods of Association of Official Analytical Chemists, [7].

Bulk density, swelling power, dispensability of the sample and wet ability were determined using the methods described by [8].

Water Absorption Capacity was determined using the method described by [9].

The consumer acceptability test was determined using the method described by [10].

IV. Result

TABLE I (a)
PROXIMATE COMPOSITION OF THE FLOUR BLENDS

Sample/ Parameters	BOA	AOB
H_2O (%)	6.30	6.20
Protein (%)	1.75	3.01
C. fiber (%)	0.85	1.06
Fat (%)	0.60	3.20
Ash (%)	0.06	0.20
CHO (%)	90.44	85.79

TABLE I (b)
PROXIMATE COMPOSITION OF THE FLOUR BLENDS

Sample/ Parameters	DOC	COD
H_2O (%)	6.50	6.80
Protein (%)	4.82	6.58
C. fiber (%)	1.55	2.06
Fat (%)	4.40	6.80
Ash (%)	0.40	0.60
CHO (%)	82.33	5.79

TABLE II (a)
FUNCTIONAL PROPERTIES OF THE FLOUR BLENDS

Sample/ Parameters	BOA	AOB
H_2O Absorpcapacit (%)	2.20	2.22
Swelling cap. (%)	1.22	1.23
Bulk density (g/ml)	0.55	0.52
Wetability (secs)	16	18
Dispersability (%)	80	60

TABLE II (b)
FUNCTIONAL PROPERTIES OF THE FLOUR BLENDS

Sample/Parameters	DOC	COD
H_2O Absorp. capacit (%)	2.43	2.63
Swelling cap. (%)	1.17	1.11
Bulk density (g/ml)	0.51	0.50
Wetability (secs)	19	20
Dispersability (%)	58	54

TABLE III (a)
MEAN SCORES FOR SENSORY PARAMETERS OF COOKIES FROM THE FLOUR BLENDS

Sample/ Parameters	BOA	AOB
Color	4.20	3.87
Crispiness	4.60	4.07
Taste	4.70	3.80
Aroma	4.67	3.87
Overall Acceptability	4.60	4.27

TABLE III (b)
MEAN SCORES FOR SENSORY PARAMETERS OF COOKIES FROM THE FLOUR BLENDS

Sample/ Parameters	DOC	COD
Color	3.47	2.53
Crispiness	3.53	3.00
Taste	3.13	2.67
Aroma	3.33	2.73
Overall Acceptability	2.47	2.93

TABLE IV (a)
VARIANCE RATIO (F-CALCULATED AND F-TABULATED VALUE) FOR SENSORY PARAMETERS F VALUE AT 5%

Sample/ Parameters	TABULATED	CALCULATED
Color	2.84	7.57
Crispiness	2.84	6.52
Taste	2.84	10.76
Aroma	2.84	7.48
Overall Acceptability	2.84	7.60

TABLE IV (b)
VARIANCE RATIO (F-CALCULATED AND F-TABULATED VALUE) FOR SENSORY PARAMETERS F VALUE AT 1%

Sample/ Parameters	TABULATED	CALCULATED
Color	4.31	1.26
Crispiness	4.31	2.22
Taste	4.31	2.37
Aroma	4.31	0.96
Overall Acceptability	4.31	1.26

Keys to all tables
BOA = 100% Corn Flour
AOB = 97.5% Corn Flour to 2.5% Moringa Flour
DOC = 95% Corn Flour to 5% Moringa Flour
COD = 92.5% Corn Flour to 7.5% Moringa Flour

V. Discussion

The incorporation of moringa greatly increased the fat content of the flour. The fat content increased from 0.60 to 3.20, 4.40, and 6.80 with moringa flour blends of 2.5, 5 and 7.5% respectively. There was also an increase in the amount of the protein content in the maize-moringa flour blends as shown in Tables I (a) and (b), which was as a result of moringa seed flour added..The ash and crude fiber also

showed appreciable amount of increase after blending with different ratio of moringa seed flour. The blend with 7.5% of moringa contained almost the highest amount in all the nutrients composition as shown in Tables I (a) and (b). The results from the proximate analysis showed great improvement in the quality characteristics of the flour [11].

However, the carbohydrate on the other hand was seen to be decreasing as the percentage of the moringa added was increasing. This was so because moringa is a legume which is rich in protein and fat [12].

In terms of swelling power, which range from 1.22 to 1.11, bulk density from 0.55 to 0.50 and wet ability from 80 to 54, there was minimal decrease in the parameters as the proportion increased. The water absorption increased with increase in sample proportion from 2.20 to 2.62 and dispersability from 16 to 20. This implies that the incorporation of moringa at these levels did not affect the physiochemical properties of the corn flour, hence good dough can still be made with the blend

The work of [13] corroborated this that the functional properties of corn flour with moringa blends showed no significant difference from the reference value.

The sensory evaluation results showed some significance differences in the parameters of cookies from different blends with moringa seed flour. The general acceptability of cookies from the four different blends showed that cookies with 7.5% of moringa flour were very much accepted by the panellists in terms of the color, crispiness, taste, aroma and overall acceptability as it is indicated by lower mean score of 2.53, 3.00, 2.67, 2.73 and 2.93 respectively, which is close to 3 on the hedonic scale. As a score of 3 on the hedonic scale translate to like moderately. On the other hand cookies from 100% maize flour received the highest mean score in all the sensory parameters of 4.20, 4.60, 4.73, 4.67 and 4.60 respectively which is close to 5 on the scale. A score of 5 means neither like nor dislike. The sensory parameters of samples with 2.5% and 5% inclusion of moringa flour respectively were alike as they were both close to 4. On the hedonic scale a score of 4 translate as like slightly. The panellists preferred sample with 7.5% of moringa flour to every other sample, followed by sample with 2.5% and 5% of moringa flour while the least to be accepted by panellists was the reference sample. There was significance difference in color, crispness, taste, aroma and overall acceptability at 5% level for all the samples at different blends while there was no significant different at 1% level of significance. The significance difference could be as a result of the color, aroma, crispness, taste and overall acceptability of the moringa flour added [10].

VI. Conclusion

The results obtained from this research work showed that moringa seed flour has great effect on the quality of the maize flour. The results also established that moringa is rich in protein and fat. Hence, it can be used as substitute for protein and fat from animal origin.

The continual increase in the cost of food commodity as a result of economic instability makes it difficult especially for the lower class to have a nutritious diet that contains all the essential nutrients. Hence moringa being rich in all nutrients and affordable will serve as substitute for food from other sources.

The results also showed that the blend with 7.5% of moringa was preferred by the panellists, hence incorporation of moringa seed flour at 7.5% is recommended.

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