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# Sensory Analysis of Composite Muffins Produced Fromguinea Corn and Wheat Flour Blends

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***ABSTRACT***

*Muffins are individual-sized, baked quick bread products that areprepared in very short periods about five to ten minutes. They are a good source of fibre if they contain bran, fruits and vegetables as compared to bread. The objective of the study was to prepare muffins using guinea corn flour as composite ingredients to wheat flour. Various composite flours were done using different measurements.* ***Sample A*** *contained (100% wheat flour);* ***Sample B*** *(60% of wheat and 40% guinea corn);* ***Sample C*** *(75% of wheat and 25% of guinea corn); and* ***Sample D*** *(25% wheat and 75% guinea corn). The samples were produced using the same procedures and conditions. Sample D was liked much by 34 respondents for its mouth-feel and flavour. Although all the four samples were generally accepted, Sample D was the most preferred among the samples. It can be concluded that wheat flour can be substituted from 25% up to 75% with guinea corn and used for many pastry products in order to increase the nutritional content.*

***Key words:*** *Guinea corn Flour, composite Muffins, baked products, cereals*

## 1. INTRODUCTION

Cereals are edible grains which come in different types and are used to prepare different delicacies.Products made from cereals are important sources of energy, carbohydrate, protein and fibre. There are different types of cereals and they include wheat, maize, rice, barley, rye, oats, millet and sorghum also known as guinea corn, (Adebowale& Sanni, 2011).

Guinea corn (*Sorghum bicolor* (L.) Moench) is one of the essential cereal vegetation extensively grown in Nigeria, and a totally crucial staple food for the public especially in the northern part of the United States of America(Tashikalma et al., 2010). The Nigerian sorghum manufacturing changed into 11.5 lots in 2010 and forecast was 11.7 tons in 2011 (USDA, 2010). The crop yield has accelerated because of the recognition of farmers who cultivate such crops in abundance. Boiled guinea corn is one of the most effective usedby the people in Ghana and small,corneous grains are typically desired for various forms of food products. The complete grain can be milled into flour or decorticated earlier than grinding to provide both a nice particle product and flour, that is then used in diverse conventional foods (Leder, 2004). It is also a total precious commercial crop for non-alcoholic drink in addition to confectionery industry in Nigeria (Baiyengunhi and Fraser, 2009).

Production of guinea corn in Ghana as at 2011 according to the Ministry of Agriculture changed into to the tone of 287,000 MT. However in 2012, the manufacturing of guinea corn dropped by

2.5% giving a complete of 280,000 MT despite the fact that there was a widespread growth in the total manufacturing of cereals in 2012 (29,192,000 MT) as compared to 2011 (27,907,000 MT). Ghana is one of the important sorghum producing nations in the world by means of harvesting quantities (FAOSTAT, 2010).

Muffins may be topped with candy toppings, consisting of jam or honey, or savoury toppings (e.g., spherical sausage, cooked egg, cheese or Sir Francis Bacon). Muffins are prepared in both savoury varieties, consisting of cornmeal and cheese muffins, or sweet sorts consisting of blueberry, chocolate chip or banana flavours. Muffins are regularly eaten as a breakfast food accompanied with a cup of tea. Fresh baked Muffins are bought by bakeries, a few rapid meals restaurants, teashops and cafeterias. The call was found in print in 1703, spelled muffin; it is far assumed that it become derived from the Low German Muffin that means a small cake (Harper, 2006).

Guinea corn is wealthy in vitamins for suitable fitness. It gives 329 calories, 72% carbohydrates, 4% fats and 11% protein. The crop elements have numerous vital vitamins in wealthy content material. Those critical nutrients discovered inside the seed are sodium, potassium, magnesium and phosphorus. There are B nutrients, niacin, thiamin and vitamin B6, and several nutritional minerals but very low in calcium, iron and copper (Adepoju, 2007).

Given the nutritional composition of guinea corn and it advantages to the health of consumers, the have a look at seeks to develop and compare guinea corn as composite flour for the manufacturing of cakes.

## 2. DESIGN AND METHODS

### *2.1 Research Design*

An experimental research design method was adopted. With experimental research involves manipulation with an independent variable in order to assess its impacts on dependent variables

(Dudovskiy, 2016). In this study, wheat flour muffin sample wasused as an independent variable while guinea corn enriched muffin samples were independent variable. Consumers were randomly selected to perform sensory analysis of the products.

### *2.2 Source of Raw Materials*

Ingredients used for the preparation of the composite flour were purchased from the main market of the Bolgatanga Municipality. The major ingredients include wheat flour, guinea corm, butter, eggs, baking powder, vanilla, sugar and powdered milk.

### *2.3 Preparation of Guinea Corn Flour*

Guinea corn was cleaned and was sorted to remove unwanted particles and other foreign seeds. The cleaned and dried nuts were milled and sieved. The resultant flour was then stored in an airtight container and kept until the time of producing the muffins.

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**Figure 1: process of guinea corn flour**

### *2.4 Ingredients for guinea corn muffin*

The ingredients used for the preparation of the guinea corn muffins includes guinea corn flour, wheat flour, sugar, baking powder, salt, milk, butter, eggs and vanilla. These are listed in the table 1 with their measurements.

**Table 1: Ingredients and their measurements**

| Ingredients | Sample A(100% wheat flour) | Sample B(60% of wheat and 40% guinea corn flour) | Sample C(75% of wheat and 25% of guinea corn flour) | Sample D(25% wheat and 75% guinea corn flour ) |
|---|---|---|---|---|
| Wheat flour | 200g | 120g | 150g | 50g |
| Guinea corn flour | - | 80g | 50g | 150g |
| Sugar | 100g | 100g | 100g | 100g |
| Baking powder | 1 tablespoon | 1 tablespoon | 1 tablespoon | 1 tablespoon |
| Salt | 1 teaspoon | 1 teaspoon | 1 teaspoon | 1 teaspoon |
| Liquid (Milk + water) | 300ml | 300ml | 300ml | 300ml |
| Butter or margarine | 50g | 50g | 50g | 50g |
| Eggs | 2 large | 2 large | 2 large | 2 large |
| Vanilla | 1 teaspoon | 1 teaspoon | 1 teaspoon | 1 teaspoon |

### 2.5 Production of Guinea Corn Muffins

The muffins were prepared using a method suggested by the US Grain Council (2004) with little changes. First, preheat oven to 400ºF (200ºC). Generously grease 12-cup nonstick standard size muffin pan.

Wheat flour and guinea corn flour were measured into a mixer bowl. 100g of sugar, 1 tablespoon of baking powder and 1 teaspoon of salt were added and blended together. After that milk, butter, eggs, vanilla where added and blended until ingredients were thoroughly moistened

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to become a paste. The paste was spooned evenly into muffin pan and ½ teaspoon of sugar was sprinkled on each muffin.

The muffins were baked for 25 minutes or until tops of muffins were lightly browned before removing from the oven. Baked muffins were left to cool for about 10 minutes. The muffins were gently removed from the pan and placed on wire rack to cool for another 10 minutes.

Various composite flours were done using different measurement of the guinea corn and wheat flours. The muffins samples were produced and labelled as follows: **Sample A** contained 100% wheat flour (control sample); **Sample B** contained 60% of wheat flour and 40% guinea corn; **Sample C** was made of 75% of wheat flour and 25% of guinea corn flour and **Sample D** was 25% wheat flour and 75% guinea corn flour. The samples were produced using the same procedure and conditions as shown in the flow chart below.

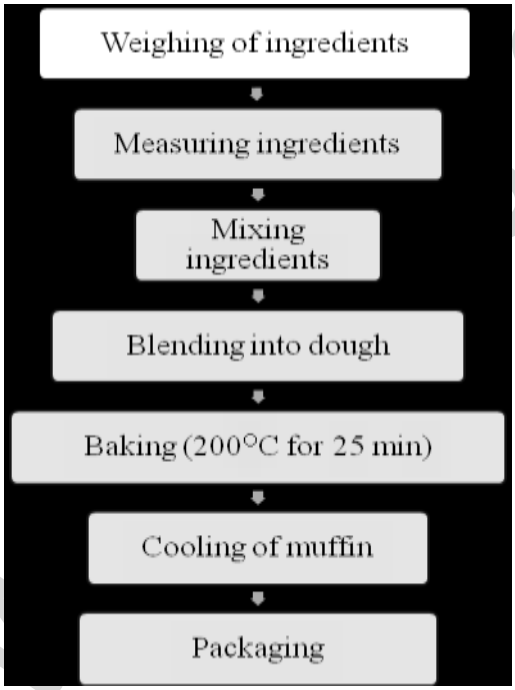


**Figure 2: Flow chart for preparation of composite guinea corn muffins**

### *2.6 Validation of the Procedure*

The muffins were analysed by experts in the bakery industry after developing it four different times in order to perfect the procedure. The experts provided suggestions to improve on the procedure before the final products were developed. Those involved with the sensory evaluation were provided with a questionnaire to express their views on the products. Drinking water was provided for rinsing their mouth, before and after tasting each sample.

### *2.7 Sensory Analysis*

The sensory evaluation was done on four different muffins samples: Sample A, Sample B, Sample C, and Sample D. 50 consumers were randomly selected from among the bakers to evaluate the four coded samples on a 5-point hedonic scale with 1 = liked much, 2 = liked

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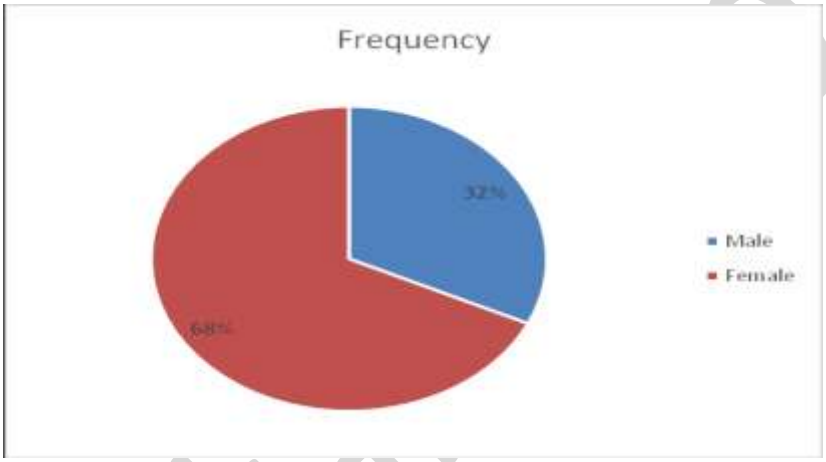
slightly, 3= neutral, 4= disliked slightly and 5= disliked much in an experiment for sensory evaluation on the parameters (colour, taste, mouthfeel, flavour and overall acceptability).

### *2.8 Data Analysis*

The responses to the questionnaire and interviews were edited and analysed using the Statistical Package for Social Sciences (SPSS). The findings were summarized in tables, charts, graphs, frequencies and percentages.

## 3.0 RESULTS AND DISCUSSION

### *3.1 Demographic Data*




**Source: Field work, 2019**

**Figure 3: respondents' gender**

68% of participants were females while 32% were males (Figure 3). This shows that there were more female participants in the study. This can suggest that patronisation of the product will be mostly by females.

**Table 2: Respondents age groups**

| | Frequency | Percent |
|---|---|---|
| 16-25 years | 30 | 60 |
| 26-35 years | 16 | 32 |
| 36-45 years | 2 | 4 |
| 46-55 years | 2 | 4 |
| Total | **50** | **100** |

Source: Field work, 2019

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Table 1 shows the age of the respondents sampled for the study. Out of the responses obtained from the field, the majority were within the ages of 16-25 years representing 60%. This was followed by those aged between 26-35 years representing 32%. It can be said that the respondents were mostly middle aged with few older adults between 36 years and above representing 8%. The nature of the age grouping will have an effect on other preferences for the muffins as young people tend to have a different taste and preference as compared to adults.

### *3.2 Knowledge and use of guinea corn*

All the respondents engage have heard of guinea corn. They were asked to indicate whether they use it or not. 82% of the respondents stated that they use guinea corn. Guinea corn is mostly used for food by the respondents. The most common use of guinea corn per the study undertaken was for preparation of TZ. Others use it for porridge while other uses it for local beverage (pito). Just few use it for cakes.

### *3.3 Sensory evaluation of guinea corn muffins*

The muffins samples produced were presented to respondents to taste and provide their analysis on them based on colour, taste, mouthfeel, flavour and overall acceptability of the muffins. Due to the scattered nature of the result obtained, the scale used was readjusted in order to obtain a more viable result. 1 = liked much, 2 = liked slightly, 3= neutral, 4= disliked slightly and 5= disliked much.

#### 3.3.1 Colour Analysis

**Table 3: Likeness based on colour**

| | **Sample A** | **Sample B** | **Sample C** | **Sample D** |
|---|---|---|---|---|
| | ***Frequency*** | ***Frequency*** | ***Frequency*** | ***Frequency*** |
| Liked Much | 38 | 39 | 34 | 36 |
| Liked Slightly | 11 | 10 | 13 | 9 |
| Neutral | 1 | - | 2 | 2 |
| Disliked Slightly | - | 1 | - | 2 |
| Disliked Much | - | - | 1 | 1 |
| | **50** | **50** | **50** | **50** |

Source: Field work, 2019

The results generated show that there was likeness for all the samples. Closely, sample B was liked very much by 39 of the respondents as compared with Sample A, C and D when describing the colour appearance of the muffin samples. Sample A had 38 after Sample B, sample D had 36 and Sample C had 34. It may be the ideal appearance that most pastry customers will prefer when considering guinea corn enriched muffins. Sample B contained 60% of wheat flour and 40% of guinea corn.

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### 3.3.2 Taste Analysis

**Table 4: Likeness based no taste**

| | Sample A *Frequency* | Sample B *Frequency* | Sample C *Frequency* | Sample D *Frequency* |
|---|---|---|---|---|
| Liked Much | 38 | 33 | 34 | 31 |
| Liked Slightly | 10 | 14 | 12 | 15 |
| Neutral | 1 | - | - | - |
| Disliked Slightly | 1 | 2 | 2 | 1 |
| Disliked Much | - | 1 | 2 | 3 |
| | **50** | **50** | **50** | **50** |

Source: Field work, 2019

Every consumer of a food product is concerned about its taste. Taste here refers to ascertaining the flavour of something/food by taking a little into the mouth. Sample A containing 100% wheat flour was liked much by 38 of the respondents followed by Sample C, B and D respectively (Table 7). The result may be because wheat products are the commonest and mostly used in baking. However the other samples were also liked much.

**Table 5: Comparison of taste with other products**

| | Frequency | Percent |
|---|---|---|
| Excellent | 24 | 48 |
| Very good | 20 | 40 |
| Good | 5 | 10 |
| Average | 1 | 2 |
| **Total** | **50** | **100** |

Source: Field work, 2019

Respondents were asked to compare the taste of the guinea corn muffins to others on the market. The assessment and response of the respondents indicates that the samples are excellent as indicated by 48%. 40% stated that it was very good with only 2% placing them on the average. The detail can be seen on table

### 3.3.3 Mouth-feel Analysis

The mouth-feel refers to the sensation created by food or drink in the mouth. The assessment of the mouthfeel of the muffins samples as indicated by the respondents are represented on Table 8. Sample D with 25% wheat flour and 75% guinea corn flour was liked much by 34 respondents although 4 respondents indicated not to like it (Table 9). Summing the result for Sample A and B, it can be said that both were liked by 48 of the respondents. Whereas 1 disliked sample A, 2 disliked Sample B.

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**Table 6: Likeness based on mouthfeel**

| | Sample A *Frequency* | Sample B *Frequency* | Sample C *Frequency* | Sample D *Frequency* |
|---|---|---|---|---|
| Liked Much | 33 | 33 | 32 | 34 |
| Liked Slightly | 15 | 15 | 14 | 12 |
| Neutral | 1 | - | - | - |
| Disliked Slightly | - | 1 | 2 | 1 |
| Disliked Much | 1 | 1 | 2 | 3 |
| | **50** | **50** | **50** | **50** |

Source: Field work, 2019

### 3.3.4 Flavour Analysis

Here the researchers sought to assess the flavour of the muffin sample provided. The flavour refers to the quality of something that affects the sense of taste. Flavour is the blend of taste and smell sensations evoked by a substance.

**Table 7: Likeness based on flavour**

| **Flavour** | **Sample A** *Frequency* | **Sample B** *Frequency* | **Sample C** *Frequency* | **Sample D** *Frequency* |
|---|---|---|---|---|
| Liked Much | 34 | 32 | 29 | 37 |
| Liked Slightly | 13 | 14 | 18 | 10 |
| Neutral | 2 | 1 | 1 | - |
| Disliked Slightly | - | 2 | - | - |
| Disliked Much | 1 | 1 | 2 | 3 |
| | **50** | **50** | **50** | **50** |

Source: Field work, 2019

From table 7, Sample D which contained 75% guinea corn flour was liked much for its flavour although 3 disliked it. The other samples too were liked much by 34, 32, 29 for samples A, B and C respectively. It can be concluded that the flavour of the guinea corn muffins should be similar to that of sample D.

### 3.3.5 Overall acceptability

An objective the study was to assess whether the muffins will be accepted when produced. The respondents were asked to indicate their overall acceptability of the product after assessing the colour, taste, mouthfeel and taste of the guinea corn enriched muffins provided them. The result is presented on Table 7.

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**Table 8: Overall acceptability**

| | Sample A *Frequency* | Sample B *Frequency* | Sample C *Frequency* | Sample D *Frequency* |
|---|---|---|---|---|
| Liked Much | 34 | 30 | 35 | 38 |
| Liked Slightly | 14 | 18 | 11 | 7 |
| Neutral | 1 | 1 | 2 | 2 |
| Disliked Slightly | - | - | 1 | 1 |
| Disliked Much | 1 | 1 | 1 | 2 |
| | **50** | **50** | **50** | **50** |

Source: Field work, 2019

The assessment indicates that sample D containing much of the guinea corn was much accepted by most of the respondents (39) than the other samples. The level of likeness for the other samples may suggest that they are equally accepted and would be patronized when produced.

### *3.3.6 Preferences*

After the sensory analysis, the respondents were asked to indicate which of the samples they most preferred. It was realized that sample D containing 25% of wheat flour and 75% of guinea corn flour which is a new product developed was most preferred as indicated by the respondents with a majority of 23. This shows that if guinea corn enriched muffins are to the produced and sold, sample D will be the ideal example as it is most preferred.

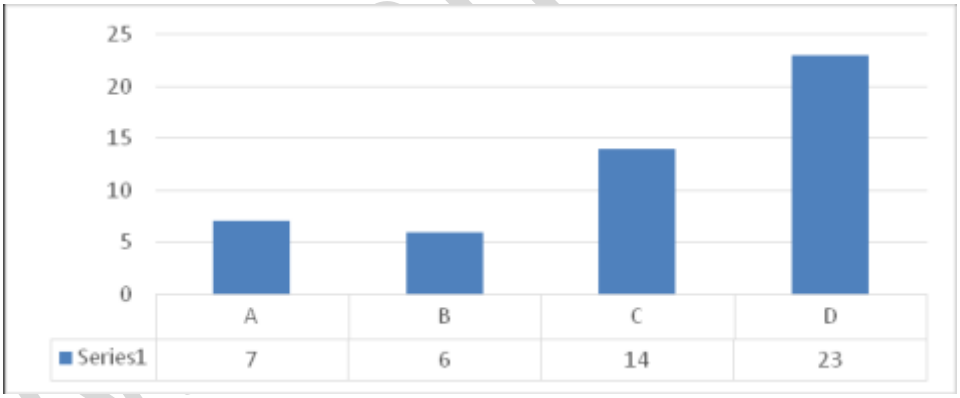


**Figure 4: Most preferred**

Also there was desire to identify which of the samples was not appealing to the respondents. It came to realization that Sample C containing 75% of wheat and 25% of guinea corn was the least preferred as indicated by the majority of the respondents. The result is shown of figure 7 below.

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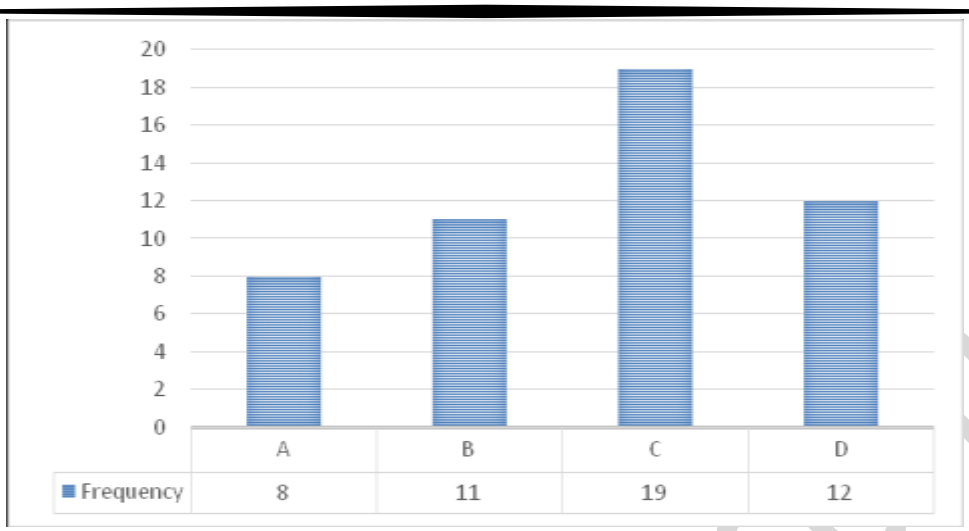


**Figure 5: Least preferred**

A 58% majority of the respondents stated that the guinea corn muffin samples are excellent with regards to quality standards. While 36% feel it is very good only 2% indicates that it was poor in comparison with quality standards (Table 5). It therefore suggests that the product can compete with other quality products.

**Table 9: How the product meets quality standard**

| | Frequency | Percent |
|---|---|---|
| Excellent | 29 | 58 |
| Very good | 18 | 36 |
| Good | 2 | 4 |
| Poor | 1 | 2 |
| **Total** | **50** | **100** |

Source: Sensory Test 2017

After rating the product as very good and excellent, it was brought to realization that 98% of the respondents would recommend the product to others as shown on the figure 8 below. This suggests that consumers are ready to accept the product, demand it and also recommend it to others. It therefore suggests that the product will be accepted on the market.

## CONCLUSION

Undertaking this research was and exciting experience. In general, the study revealed that guinea corn flour can be used in the production of muffins and other pastry products. As a composite to wheat flour, it can be substituted from 25% up to 75% and used for many pastry products such as muffins without affecting the quality of the resultant product but increasing its nutritional content of the product given the combination of two flours. This is evidenced by the degree of acceptability indicated by the respondents who were selected to perform analysis of the muffins samples produced during the study.

The success of this experiment and assessment of consumer acceptability of the resultant product indicates that there will be increased demand for guinea corn which is likely to affect the economic return for guinea corn farmers in the region.

**REFERENCE**

i. Adebowale, A.A. and Sanni, L.O. (2011) Cereals and Tuber Technology Lecture Note of the Department of Food Science and Technology, University of Agriculture, Abeokuta. http://www.unaab.edu.ng/attachments/455_FST%20501%20lecture%20note-DR%20ADEBOWALE.pdf.

ii. Adepoju. O. T (2007). Nutrient composition, anti-nutritional factors and contribution of dry guinea corn leaf (Poporo) extract to nutrient intake of consumers. Nig J Nutr Sci., 28 (1) 140-148.

iii. Baiyengunhi, L. J.S. and Fraser, G. C. G. (2009). Profitability in sorghum production in three villages of Kaduna State Nigeria. Journal of Applied Sciences Research, 5(10): 1685 – 1691

iv. Dudovskiy, J. (2016). The Ultimate Guide to Writing a Dissertation in Business Studies: A Step-by-Step Assistance.

v. Harper, J. M. (1992). A comparative analysis of single and twin screws extruders. In Kokini J. L., Ho Karwe M. V. (eds) Food Extrusion Science and Technology, Mercel Dekker Inc, New York.

vi. Leder, I. (2004). Sorghum and millets, in Cultivated Plants Primarily as Food Sources, (Ed. Gyorgy Fuleky), in Encyclopedia of Life Support Systems (EOLSS), developed under the auspices of the UNESCO, Eolss publishers, Oxford, UK (http://www.eolss.net), 18pp

vii. Tashikalma, A. K., Stephen, J. and Umaru, A. (2010). Economic analysis of sorghum production in Michika Local Government Area of Adamawa State, Nigeria. Journal of Sustainable Development in Agriculture and Environment, 5(1): 10 – 20

viii. USDA Foreign Agricultural Service (2010). Nigeria grain and feed annual. Grain Report, Number NI0007. United States Department of Agriculture, 11pp