

## PROXIMATE ANALYSIS AND SENSORY EVALUATION OF INFANT WEANING FOOD PRODUCED WITH COMPOSITE FLOUR OF SORGHUM (*Sorghum bicolor*), MELON (*Citrullus colocynthis* L) AND FLUTED PUMPKIN (*Telfairiaoccidentalis*)

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### ABSTRACT

*Infancy is one of the most critical nutritional periods of life cycle. From age of six months, known as weaning period, an infant's need for energy and nutrients is provided through complementary foods with nutritional balanced contents. This paper therefore set out to formulate low cost, nutritive infant weaning food using sorghum, melon and fluted pumpkin. Basically the paper determined the proximate and sensory attributes of weaning foods made from composite flour of sorghum, so as to verify its adaptability for household consumption especially for low income earners. The foods were produced by the inclusion of pumpkin seed and melon seed flours to sorghum to form blends ranging from 10% to 20% inclusion of the test flours both separately and in combined forms. Laboratory analysis of the produced weaning foods showed general preference for sample 815 (60:20:20 sorghum, melon and pumpkin) based on a ten-man sensory panelists' assessment. Similarly, the functional properties indicated significant differences in the water absorption capacity, bulk density, gelation temperature, swelling index, foaming capacity and wettability. Nutritionally, the protein content ranged from 14.53% to 20.9% while the fat content ranged from 3.40% to 16.5%. Ash content and moisture content ranged from 2.31% to 3.11% and 9.64% to 9.87% respectively. Generally, the combination of sorghum, melon and pumpkin seed at 6:20:20 ratio gave the most acceptable blend and was therefore adopted as the best. The study therefore recommended that the blend should be adopted at both domestic and higher levels for weaning of infants.*

**Keywords:** *Sorghum, Melon, Fluted pumpkin, Proximate, Sensory, Weaning.*

### INTRODUCTION

A new born infant, or neonate, is a child under 28 days of age. During these first twenty eight (28) days of life, the child is at higher risk of dying. It is thus crucial that appropriate feeding and care are provided during this period, both to improve the child's chances of survival and to lay the foundations for a healthy life (World Health Organisation (WHO), 2018). Proper infant nutrition is fundamental to a child's continued health, from birth through adulthood. Correct feeding in the first three years of life is particularly important due to its role in lowering morbidity and mortality, reducing the risk of chronic diseases throughout their lives span, and promoting regular mental and physical development (WHO, 2020). Although every infant and child has the right to good nutrition under the Convention on the Rights of the Child, in many countries, less than a fourth of infants have access to the required dietary diversity and feeding frequency. Inappropriate feeding practices contribute up to a third of all cases of child malnutrition. This is compounded by the

proliferation of processed foods like infant formula and products rich in salt, free sugars and trans-fat. This causes an increase in poor diets, obesity and a marked reduction in the number of mothers breastfeeding their babies (WHO, 2020).

Malnutrition in the early years of life can have long-lasting impacts on physical and mental development, which in turn affects a person's educational performance and later employment opportunities. The extent of this issue is such that it has a sizeable effect on economic markers in some countries and is considered a major global health problem (WHO, 2020). Thus, the World Health Organisation states that around the age of 6 months, an infant's need for energy and nutrients starts to exceed what is provided by breast milk, and complementary foods are necessary to meet those needs. An infant of this age is also developmentally ready for other foods. This transition is referred to as complementary feeding also known as weaning.

Weaning is defined as the introduction of foods other than breast milk into an infant's diet, while slowly reducing breastfeeding (WHO, cited in Manzoor, et al., 2009). According to Foote and Marriot (2003), the World Health Organisation uses the term weaning in a more limited sense to indicate complete cessation of breast feeding. Also known as complementary feeding, weaning entails the provision of any nutrient containing foods or liquids other than breastmilk and include both solid food and infant formula. In the UK, the terms "weaning" and "complementary feeding" are sometimes used synonymously to mean infant solid feeding. By the end of the weaning process, the infant no longer receives breast milk (or milk from a bottle), in the process of finally eating the family's table food (Ralph, cited in Brown 1978). Thus, weaning is the substitution of solid foods or special childhood foods for breast or bottled milk. Others propose that any substitution of the biological nutrition, breast milk, is weaning. If the weaning starts when breast milk is still sufficient, for example prior to 6 to 7 months of age, it is un-physiological weaning (Taba, cited in Brown, 1978). The weaning period is thus defined as the total period during which breast milk is being replaced by any other foods.

Due to the prevailing economic situation in Nigeria, commercially processed infant weaning foods are not within the reach of majority of low income nursing mothers, severe protein energy malnutrition stands out as the most serious of the nutritional deficiency problem in this sector since children are weaned on cheap but usually deficient protein quality foods. Furthermore, most good quality protein food sources are not adequately utilized due to inadequate processing, hence, the necessity to formulate low cost weaning foods from local food sources that will meet the healthy growth needs of children by complementing cereals and legumes. This research therefore attempts to formulate low cost, nutritive but bulk reduced infant weaning food using sorghum, melon and fluted pumpkin seeds to determine its potential of being produced locally from local raw materials and its adaptability for household consumption. This locally formulated food will help the low income earners to have a nutritive balanced food for their babies.

By way of description, **Sorghum (sorghum bicolor [L.] Moench)** is one of the most important staple foods in low-income and high-income countries (Shehab, Kansowa, & El-Beltagi, 2010).

The nutrient composition of sorghum indicates that it is a good source of energy, proteins, carbohydrates, vitamins and minerals including the trace elements, particularly iron and zinc, except calcium. Sorghum grain contains minerals such as phosphorus, potassium and magnesium in varying quantities (Dicko et al., 2006; cited in Sengeev, Ariaahu, & Gernah, 2016). Sorghum has multifarious usages and the whole grain can be ground into flour which is then used in various traditional foods (Mohammed, 2011; cited in SenceAgric, 2013). Similarly, **Melon (*Citrullus colocynthis* L)** also referred to as *Citrulluslanatus* Thumb, *Curcurbitacitrullus* L. or *Colocynthiscitrullus* L., as documented by Quattrocchi (2000) cited in Shehab, et al., (2010) belongs to the Cucurbitaceae family, a large plant family which consists of nearly 120 genera and 825 species (Milind & Kulwant, 2011). In West Africa, melon is called egusi, derived from the Yoruba language (Abiodun & Adeleke, 2010). Curcubits are known for their high protein and oil content. Seeds of cucurbits are sources of oils and protein with about 50% oil and up to 35% protein (Achu, 2005; cited in Abbah, et al., 2015). According to National Research Council (NRC) (2006), this traditional food plant has potential to improve nutrition and boost food security. In the same vein, **Fluted Pumpkin (*Telforia occidentalis*)** is mainly cultivated in Nigeria for its highly nutritious leaves which are used primarily in soups and herbal medicines. Common names for the plant are fluted gourd, fluted pumpkin and ‘ugu’. The fruits are not edible but seeds produced by the gourd are high in protein and fat meaning that they can be included in the dishes to make a well-balanced diet ([digitalkobo09.blogspot.com.ng](http://digitalkobo09.blogspot.com.ng)). The large dark-red seed is rich in protein and fat which can be eaten whole, ground into a powdery form to be used for certain kind of soup or made into a fermented porridge as the case may be. The fluted pumpkin is also considered as oilseed due to its high oil content of about 30%. The shoots contain high levels of potassium and iron while the seeds are made up of 27% crude proteins and 53% fat (Sense Agric, 2016).

## OBJECTIVES OF THE STUDY

The main aim of this paper is to carry out a proximate analysis and sensory evaluation of infant weaning food produced with composite flour of sorghum (*Sorghum bicolor*), melon (*Citrulluscolocynthis*L) and fluted pumpkin (*Telfairiaoccidentalis*). Specifically, the study intends to:

- i. determine proximate composite of weaning food made from composite flour of sorghum.
- ii. determine sensory attributes of weaning food made from composite flour of sorghum.

## MATERIALS AND METHODS

### Sample Procurement

The raw materials: sorghum grains, Melon seeds and Fluted Pumpkin seeds were each sourced from a local market in Umuahia. These materials were transported to the Michael Okpara University of Agriculture, Umudike, nutrition laboratory for processing prior to product formulation and subsequent analysis.

## Proximate Analysis

### Determination of moisture content

The gravimetric method as described by (AOAC, 1990) was used to measure weight of samples. A measured weight of the samples was weighed into a previously weighed moisture can. The Samples in the can were dried in the oven at 105.0 C for 3hours. It was cooled in a desiccator and weighed. They were again reheated and dried. Drying, cooling and weighing were done at hourly interval until a constant weight was obtained. The weight of moisture lost was calculated and expressed as a percentage of weight of samples analyzed. It was given by the expression below:

$$\% \text{Moisture Content} = (W3-W1) / (W2-W1) \times 100\%$$

Where W1 = weigh of empty moisture can

W2 = weigh of empty can + sample before drying

W3 = weight of can + sample dried to constant weigh

### Determination of protein

This was done by Kjeldhal method described by Chang (2003). The total N<sub>2</sub> was determined and multiplied with factor 6.25 to obtain the protein content. I gram of sample was mixed with 10ml of concentrated H<sub>2</sub>SO<sub>4</sub> in a digested flask. A tablet of selenium catalyst was added to it before it was heated under a fume cupboard until a clear solution was obtained (i.e. the digest). The digest was diluted to 100ml/s in a volumetric flask and used for analysis. Then 10ml of 4% Buric acid containing 3 drops of mixed indicator (bromocressol green / methyl red). A total of 50ml of distillates was collected and titrated against 0.02N EATA from green to a deep red end point. The reagent blank was calculated using the formula below: % protein =% nitrogen x 6. 25

$$\%N = (100/w) \times (N \times 14/1000) \times (V_a) / T-B$$

W = weight of sample (1g)

N = Normality of titrant (0.02N. H<sub>2</sub> SO<sub>4</sub>)

V<sub>t</sub> = total digest volume (100ml)

V<sub>a</sub> = volume of digest analyzed (10ml)

B = Blank

T = sample titre value

### Fat determination

The solvent extraction gravimetric method (Kirk and Sawyer, 1980) was used. One milligramme of the sample was wrapped in a porous paper (Whiteman filter paper) and put in a thimble. The thimble was put in Soxhlet reflux flask and mounted into a weighed extraction flask containing 200ml of hexane. The upper end of a reflux flask was connected to a water condenser. The solvent hexane was heated, boiled, vaporized and condensed into a flask. Soon the sample in the thimble was covered with the solvent until the reflux flask was filled up then siphoned over, carrying its oil extract down to the flask. This process was allowed to run repeatedly for 4 hours before defatted sample was removed, the solvent recovered, and the oil extracted was left in the flask. The flask (containing the oil extract) was dried in the oven at 600<sup>0</sup>C for 30min to remove any residual solvent. It was cooled in a desiccator and weighed. By difference, the weight oil/fat was determined and expressed as the percentage of the weight of the sample analyzed and given by the expression below;

$$\% \text{ fat} = [(w_2 - w_1) / (\text{weight of sample}) \times 100]$$

Where

$w_1$  = weight of empty extraction flask

$w_2$  = weight of flask and oil extract

### **Determination of crude fibre**

The Wende method (James, 1995) was employed. Two grammes of the defatted samples was boiled in 150ml of 1.25%  $\text{H}_2\text{SO}_4$  solution for 30min under reflux. The samples were washed in several portion of hot water using two fold of muslin cloth to trap the practices. It was returned to the flask and boiled again in 150mls of 1.25%  $\text{NaH}$  for another 30 min under some conditions. After washing in several portion of hot water, the sample was allowed to drain dry before being transferred quantitatively to a weighed crucible where it was dried in the oven at 105C to a constant weight. It was there after taken to a muffle furnace in which it was burnt until only ash was left in it. It was given by the formula below;

$$\% \text{ crude} = 100(w_2 - w_3) / \text{weigh of samples}$$

Where  $w_2$  = weight of crucible + sample after boiling, washing and drying

$w_3$  = weight of crucible + sample ash

### **Ash determination**

This was carried out by furnace incineration gravimetric method (Harbers & Nielson, 2003; James, 1995). Five grammes of the processed sample was measured into a previously weighed porcelain crucible. The sample was burnt to ashes in the muffle furnace at 550<sup>0</sup>C for 2 hours. When it has become completely ash, it was calculated by difference desiccators and weight. The weight of ash obtained was calculated by difference and expressed as a percentage of the weight of sample analyzed as shown below.

$$\% \text{ Ash} = [(w_2 - w_1) / (w_1 \text{ of sample}) \times 100\%]$$

Where  $w_1$  = weight of empty crucible  $w_2$  = weight of crucible and ash

### **Determination of Carbohydrate**

Carbohydrate content was by difference. It was calculated using the formula below as described by AOAC (1990) and James (1995). % carbohydrate = 100 - % (moisture + crude protein + crude fat + crude fibre + ash).

### **Functional Properties:**

#### **Oil absorption capacity**

The method as described by Abbey and Ibeh (1988) was adopted. One gram of each of the flour samples were weighed separately and also together with a clean dry centrifuge tube into which it was placed. Oil was mixed with the sample to make up to 10ml dispersion. The sample and oil were mixed thoroughly for 30 sec, then the sample was allowed to stand for 5minutes at room temperature and then centrifuged at 1000 rpm for 5min. The volume of free oil was read directly from the graduated centrifuge tube and calculated as follows:

$$\text{Oil absorption Capacity} = x$$

$W_2$  = Weight of tube + sample before oil addition

$W_3$  = Weight of tube + sample after oil absorption

**Water absorption capacity**

This was determined in the same way as oil absorption capacity. One gramme of each sample was weighed separately and also together with a clean dry centrifuge tube into which it was placed. Distilled water was mixed with the samples to make up to 10ml dispersion. The sample and 10ml distilled water were mixed thoroughly for 30 seconds, then the sample was allowed to stand for 5min at room temperature and then centrifuged at 1000 rpm for 5minutes, then the volume of free water ( supernatant) was read directly from the graduated centrifuge tube and calculated as follows:

Water Absorption Capacity =

W2 = Weight of tube + sample before water addition

W3 = Weight of tube + sample after water absorption

**Bulk density**

This was done according to Onimawo and Akubor (2005), 10ml capacity graduated measuring cylinder was filled with the sample and the initial volume was recorded. The cylinder was tapped continuously to displace air and vacuum until the volume becomes constant. The final volume was noted after it was levelled, and bulk densities of the samples were calculated as follows:

The bulk density (g/ml) = weight of samples / volume of sample

**Emulsion capacity**

The method used was described by Okezie and Bello (1988). One gramme of sample was mixed with 10ml of distilled water in a test tube and shaken for 30 sec. 10mls of refined oil was also added and shaken continuously until properly mixed. The test was left to stand for 30 min. The height of oil separated from the sample was measured. The emulsion capacity was expressed as the amount of oil emulsified and held per gram of the sample. It is shown below;

Emulsion Capacity = Emulsion height/water height x 100

**Foam capacity**

The method of Abbey and Ibeh (1988) was adopted. Foam capacity was estimated by blending 2g of flour sample with 100ml distilled water in a warring blender (the suspension was whipped at 1000rpm for 5 min). The mixture was poured into a 250ml measuring cylinder and the volume was recorded after 30 sec. Foam capacity was expressed as percent increase in volume using the formula below:

Foam Capacity =  $x$

The foam volume was recorded at 15, 30, 60 and 120 min.

The foam stability was determined after whipping.

Foam stability =  $x$

**Wettability**

The method of Onimawo and Akubor (2005) was adopted. Wettability was estimated by measuring the wetting time (seconds) of 1g of flour sample dropped from a height of 15mm of the surface of 200cm<sup>3</sup> distilled water contained in 250cm<sup>3</sup> beakers at room temperature. One gram of the sample was weighed into a clean, dry test tube and was covered. The tube was clamped in-vertically on a retort stand 15cm over 200cm<sup>3</sup> distilled water container in 250cm<sup>3</sup> beaker at room temperature. Gently the paper covering the tube was removed and the sample was allowed to fall under gravity

into the beaker. The wetting time was recorded as the time (seconds) required for all the powder to be wetted and penetrate the surface of the still water.

### **Swelling index**

Swelling index was calculated using the method of Ukpabi and Ndinele (1990). One gram of the processed sample was weighed and dispersed into a test tube, levelled and the height noted. Distilled water (10ml) was added / stirred and allowed to stand for 1hr. The height was then recorded and the swelling index calculated as the ratio of the final height and the initial height.

Swelling index =  $H_2/H_1$  where

$H_2$  = final height

$H_1$  = initial height

### **Gelation temperature**

This was determined by Shinde (2001). One gram flour sample was weighed accurately in triplicate and transferred to 20 mL screw capped tubes. Ten mL of water was added to each sample. The samples were heated slowly in a water bath until they formed a solid gel. At complete gel formation, the respective temperature was measured and taken as gelatinization temperature.

### **Sensory Evaluation**

A ten -man untrained test panel scored the product for aroma, texture, taste and general acceptability. The panel consisting of both genders of different age groups were constituted to evaluate the quality. The judges were selected from the faculty staff and students of Department of Home Science / Hospitality Management and Tourism, Michael Okpara University of Agriculture Umudike, Abia State. Degree of acceptance or likeness was expressed on a 9 -point hedonic scale quality analysis- 9 = like extremely, 8 = like very much, 7 = like moderate, 6 = like slightly, 5 = neither like nor dislike, 4 = dislike slightly, 3 = dislike moderately, 2 dislike very much 1 = dislike extremely..

### **Statistical Analysis**

The data generated were statistically analysed using analysis of variance (ANOVA). Means were tested for significant difference using Duncan's Multiple Range Test (DMRT). Significance level was accepted at  $p < 0.05$ .

## **RESULTS AND DISCUSSIONS**

Proximate composition of the formulated weaning food flours are shown in Table I. The result shows increase in protein content of the sorghum flour from 14.5% (Sample A, 100% sorghum) to 20.9% in sample H (60:20:20 S.M.F. ) blends. The increase in protein content of the composite flour were found to be significantly different ( $p < 0.05$ ) for all the analyzed food formulas. Similar but varied levels of increase were recorded for fat, crude fibre and ash. Fat content increased from 3.41% to 16.5% in the formula containing 20% each of pumpkin and melon seed flours. Although the crude fibre increased from 0.42% in 100% sorghum to 1.37% In 30%pumpkin seed flour, the general fibre level is low and this was attributed to fire grinding and sieving which was done to obtain the formulas. Moderate increases were also recorded for the ash 2.31% to 3.11 and moisture content of 9.64% to 9.87%. Statistical analysis of variance (ANOVA) showed that most of these increase were significantly different ( $P < 0.05$ ) from one another in spite of the parameters.

In all, it was observed that the addition of melon flour and pumpkin flour resulted in fortification of the nutrient status of the resulting food formulas with increases in the major components such as protein, fat, fibre and ash.

**Table I: Proximate composition of weaning food produced from blends of sorghum, melon, and fluted pumpkin seeds.**

Samples	Protein	Fat	Fibre	Ash	MC	CHO
A	14.5a±0.00	3.41a±0.40	0.42a±0.04	2.31a±0.05	9.64a±0.02	16.8c±0.48
B	16.9d±0.46	9.89b±0.03	0.86b±0.04	2.49b±0.04	9.71b±0.03	60.1b±0.14
C	18.4e±0.20	10.5c±0.70	1.13d±0.02	2.70c±0.04	9.81cd±0.03	57.4b±0.27
D	15.5b±0.10	10.9d±0.31	1.01c±0.03	2.71c±0.10	9.80c±0.08	60.5b±0.05
E	18.9f±0.98	13.1f±0.17	1.25f±0.02	3.11f±0.03	9.83cd±0.03	58.2a±3.02
F	20.9h±0.98	12.7e±0.07	1.37h±0.12	3.01de±0.08	9.83cd±0.01	53.4a±0.93
G	15.9c±0.98	14.7g±0.07	1.22e±0.12	2.94d±0.02	9.84cd±0.02	53.2a±1.99
H	20.4g±0.20	16.5h±0.24	1.27g±0.12	3.05ef±0.01	9.87d±0.01	53.3a±3.48

Values show means of triplicate analysis ± standard deviation. Figures with different superscripts on the same column are significantly different ( $p < 0.05$ ).

Table II shows the functional properties of the different composite flours obtained from the blending of sorghum, melon and fluted pumpkin seeds. From the result, the water absorption capacity (WAC) of the control sample (sorghum flour) was 4.03g/g while those of other blends ranges from 2.40g/g (sample H) to 3.35g/g (sample B). The result revealed that water absorption capacity of the composite flour decreased with increasing addition of melon and fluted pumpkin seed flours. From sample E containing 70% of sorghum flour, down to sample H containing 60% sorghum flour, there was no significant difference ( $p > 0.05$ ) in the amount of water absorbed by the composite flours. The bulk densities also decreased with the addition of melon and fluted pumpkin seed flours 0.83g/gcm<sup>3</sup> in the sorghum flour to 0.71g/gcm<sup>3</sup> in the 60% sorghum composite flour. The result further showed that the addition of the melon and pumpkin flours did not cause any significant difference ( $p > 0.05$ ) in the temperature at which the produced foods form gel during reconstitution. The gelation temperature (GT) ranged from 75.70C in sorghum flour to 81.7<sup>0</sup>C in the 60% sorghum containing 20% each of the added flours. Also, the addition of melon and pumpkin seed flours reduced the swelling capacity (SC) of the sorghum based foods. The swelling index (SI) reduced from 1.18 at 60% sorghum and 20% of melon and pumpkin flour each. The swelling reduction was however significant ( $p < 0.05$ ) only to the point of 70% sorghum flour content. Also significant differences ( $p < 0.05$ ) was recorded at sorghum contents of 70% and below. Similar reductions were recorded in the foaming capacity (FC) of the composite flours. This reduction was attributed to the relatively higher oil in the added melon and pumpkin seed flours which tend to repel interaction between the saponin in the flours and for water to foam forth. The same reason possibly explains the higher wettability time obtained with increasing pumpkin and melon seed flours.

**Table II: Functional properties of weaning food produced from blends of sorghum, melon and fluted pumpkin seeds.**

	WAC (g/g)	BD(gcm <sup>3</sup> )	G.T. (oc)	S.I	FC (%)	WETTABILITY
A	4.03d±0.15	0.83e±0.03	75.7a±1.16	1.18bc±0.01	25.6e±0.65	16.7a±0.88
B	3.35c±0.06	0.83e±0.07	77.3b±1.16	1.21c±0.02	23.4d±0.11	19.7b±1.53
C	2.83b±0.06	0.81d±0.08	79.7c±1.16	1.13b±0.07	19.6c±0.59	25.7e±1.15
D	2.77b±0.06	0.77c±0.07	79.3c±0.58	1.05a±0.00	18.8b±0.15	27.3c±1.58
E	2.53a±0.06	0.75b±0.07	80.7d±0.58	1.06a±0.02	18.7b±0.11	32.3d±1.16
F	2.47a±0.06	0.74b±0.03	80.3d±0.58	1.05a±0.00	17.5a±0.28	32.7d±1.16
G	2.47a±0.06	0.72a±0.06	81.7d±1.80	1.04a±0.01	17.3e±0.15	39.3e±7.89
H	2.40a±0.00	0.71a±0.06	81.7d±0.58	1.06a±0.03	17.5a±0.11	42.0f±1.00

\*Values are means of triplicate determination ± standard deviation Means with different superscripts on the same column are significantly different (p<0.05)

Table III shows the scores of sensory attributes of the different weaning food products. Being scored inversely (the lower figures showed high marks), the result showed a preference of sample 482 (2.09±0.94) for appearance. On the Aroma of the products, there was general preference for sample 815 (20% added pumpkin and melon) with a score of 2.36±0.67, whereas sample 305 (10% addition of melon and pumpkin) was the least acceptable. Assessment of the taste showed sample 815 also to be the most acceptable (2.30±0.67) while sample 482 was the least (4.2±2.04). With reference to texture sample 244 (100% sorghum flour) was the most preferred while sample 394 (30% addition of pumpkin to 70% sorghum) was the least accepted. Generally therefore, there was a variation in the levels of preference of the samples regarding the different sensory attributes. On the whole, sample 815 (60:20:20, sorghum, pumpkin and melon) was the most preferred sample of all.

**Table III: Sensory Evaluation of Weaning Food**

Samples	Appearance	Texture	Taste	Odour
2224	2.55±1.75	2.55±1.51	3.10±1.37	2.55±1.13
305	3.55±1.37	3.09±1.38	3.90±1.29	4.27±1.35
482	4.09±1.45	3.55±1.29	4.20±2.04	3.64±1.50
701	4.00±1.79	3.55±1.04	3.30±1.77	3.82±1.99
525	3.64±1.57	3.73±1.27	3.30±1.83	3.18±1.25
394	4.00±2.61	4.18±1.47	3.80±2.10	3.64±1.91
495	2.82±1.54	3.91±1.70	2.50±1.35	2.82±1.87
815	2.09±0.94	3.45±0.82	2.30±0.67	2.36±0.67

\*Values are means of triplicate determination ± standard deviation. Means with different superscripts on the same column are significantly different (p<0.05).

## CONCLUSION

The use of melon seed and pumpkin seed to fortify sorghum flour resulted in a product in which the major nutrients protein, fat, fibre and ash increased significantly. Also, the produced foods were found to enjoy high level of acceptance based on their sensory attributes. However, a blend combination of 60:20:20 (sorghum, melon and pumpkin) was adjudged the best.

## RECOMMENDATION

Based on the potential nutritional qualities and benefits of a combination of sorghum, melon and pumpkin, it is therefore recommended that the blend should be adopted at both domestic and higher levels for weaning of infants especially because of the nutritive balanced contents. Similarly, the cultivation and utilization of these seeds should be encouraged while research effort should also be directed toward the shelf stability.

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