Evaluation of the Physico-Chemical and Sensory Properties of Weaning Food Produced from Fermented Yellow Maize and Soybean Composite Flours Fortified with Almond Nut Flour

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Abstract

The study was conducted to produce weaning food from fermented yellow maize-soybean composite flour blends, fortified with almond nut flour.The composite flours was prepared at ratios; 100:0, 95:5, 90:10, 85:15, 80:20: of yellow maize flour(YMF) - soybean flour(SBF), and almond nut flour respectively to obtain five blends for weaning food composite flours. The 100%, which composed of 70% yellow maize and 30% soybean composite flour for weaning food production served as the control. Standard chemical methods were used to determine the blends' functional properties, proximate composition, minerals, and sensory evaluation. The functional properties such as water absorption capacity ranged from (6.33 – 12.67 g/cm^3), foam capacity (17.61 - 42.73 %), and gelatinization temperature (75.67 - 83.33 °C) increased with increasing level of almond nut flour substitution, while oil absorption capacity (16.33 – 24.33 g/cm^3) and swelling capacity (45.56 – 66.66 %) decreases. The result showed a significant difference ($p < 0.05$) in protein content (12.46 - 27.88 %), ash content (4.74 - 6.94 %), moisture content (5.86 - 9.17 %), crude lipid content (9.81 - 19.54 %), crude fibre content (8.89 - 14.16 %) increases with almond nut flour inclusion. Carbohydrate (24.51 - 56.04 %) and the energy value ranged from 362.29 Kcal/100g to 385.45 Kcal/100g. Mineral analysis showed significant difference ($p < 0.05$), in calcium, magnesium, potassium, and iron compared with the control, same with the sensory evaluated attributes. The study shows that acceptable and nutritious weaning food, could be produced from the composite flour blends of fermented yellow maize-soybean, fortified with almond nut flour. The weaning food composite flour can also be a cost-effective and a possible tool to overcome malnutrition among children in developing countries.

***Keywords**: Weaning Food, Yellow Maize, Soybean, Almond, Formulation*

1. INTRODUCTION

Complimentary/weaning foods are foods other than breast milk or infant formula (liquids, semi-solids and solids) being introduced to infants of six month of age to provide nutrients (USDA, 2009). According to WHO (2002), complimentary food is defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirement of infants so that other foods and liquids are needed, along with breast milk. The arrival of a new born is accompanied by the secretion of the highly nutritive, thick yellowish pre-milk substance, referred to as colostrum (Gdalvevich *et al.,* (2001). The colostrum contains the very essential nutrients as well as antibodies and it helps in boosting the immunity of the infant to infections (Koch *et al*., 2003 and VanOdijk *et al*., 2003). Breast milk usually provides all the energy, nutrients and fluids that baby needs in order to grow and develop healthily during the first six months of life (AAP, 2012 and WHO, 2012). Infants when exclusively breastfed for the optimal duration of six months are significantly protected against the major childhood diseases' conditions such as diarrhea, gastrointestinal tract infection, allergic diseases, diabetes, obesity, childhood leukemia and lymphoma, inflammatory and bowel disease (AAP, 2012 and WHO, 2012). The breast milk alone remains sufficient for an infant up until the sixth months after birth. Its supply of energy, protein, vitamin A and B6 as well as calcium, meets the requirements of the infant, it is however clear that the breast milk is insufficient in its supply of vitamin D, iron and zinc (Kramer and Kakuma, 2001) and (WHO, 2002). This inadequacy becomes more elaborate after 6 months of birth due to the increase in the nutrient requirements of the infant. Therefore, there is need to mitigate the inadequacies with the use of weaning food, if malnutrition occurrence is to be avoided in the infant. The vast majority of the infants are weaned most times with the low-cost traditional weaning food and weaning practices which resulted in increased susceptibility of infants to infections, mortality and diseases such as kwashiorkor, marasmus, beriberi, rickets and several other protein-energy malnutrition and micro-nutrient under-nutrition (Dewey and Brown, 2003) and Pelto *et al*.,2003). Traditional weaning foods of West Africa are mostly based on the family staple foods which include cereals, starchy tubers, legumes and vegetables (Onofiok and Nnanyelugo, 1998) and Ndukwe, 2006). There have been several approaches aimed at addressing the challenges associated with the infants' consumption of the traditional weaning foods. These include the use of processing steps such as fermentation, malting, liquefaction, dry-milling, cereal-legume co-fermentation, fortification with selected additives while adhering to guidelines and regulations, addition of sugar and oil to cereal gruels as well as hygienic processing (Onilude *et al*.,2004) and (Wakil and Kazeem, 2012). Supplementation of maize with legumes such as cowpea, Bambara-nut and soybean, has been reported to contribute significantly to the improvement of the protein content of the cereal based foods (Mbata *et al*., 2009 and Sefa-Dedeh *et al*., 2007). The suitability of almond nut in the formulation of weaning food as a result of its high energy, resulting from the rich protein, fat and sugar content, as well as minerals (phosphorus, potassium) and vitamins C and E constituents has been reported (Ehsan *et al.,* 2009 and Blanca, 2007). Almond nut is gluten and cholesterol free and has very low sodium content, making it ideal for infants. There has been an increased awareness for the utilization of almond nut as nutritional source in recent times (Akpabio, 2012). However, almond nut remains underutilized in weaning food formulations. This work aimed at developing a good quality weaning blend having adequate protein-energy contents, necessary to promote growth and enhance nutrients retention in infants.

2. 0. MATERIALS AND METHODS

2.1. Procurement of Material

The maize (*Zea mays*), soybean (*Glycine max*.) that was used for the study was purchased from Itam market in Uyo, and almond nut (*Prunus dulcis*) was purchased at Ibiono ibom, all in Akwa Ibom State, Nigeria.

2.2. Preparation of Yellow Maize Flour

The Maize grains (*Zea mays*) was sorted manually (to remove dirt, stones, broken or moldy grains) washed and soaked in potable water at ambient temperature for 4 days for it to ferment. During the soaking period, the water was changed daily to avoid smelling. The fermented maize grains was oven dried at 80˚C, until constant weight was achieved. Attrition mill was subsequently used to mill the fermented grains. The flour obtained was sieved using 2mm mesh sieve and packaged, in an air tight sealed container, labeled and stored in a refrigerator for subsequent use (Jeanne and Therese, 2011).

2.3. Preparation of Soybean Flour

After cleaning and removal of broken seeds and extraneous materials, the soybean seeds was washed and soaked in potable water for 12hrs to reduce flatulence – causing oligosaccharides by leaching them into the water. The seeds were drained and cooked for 30mins. with potable tap water twice its volume and then dehulled. The soybeans was then dried in an oven at 65ºC for 24hrs and then milled using a hammer mill (Christy & Norris Ltd., Chelmsford, England). The flour obtained was sieved using a 2mm mesh sieve and packaged, in an air tight sealed container, labeled and stored in a refrigerator for subsequent use (Barber *et al*., 2017).

2.4. Preparation of Almond Nut Flour

Almond nuts was sorted manually to remove dirt, and stones. The nuts were blanched for 60 seconds, drained, the almond skin halted and washed. After which the blanched almond nuts was cut into thinner pieces and oven dried at 65ºC for 6hrs and then milled using a hammer mill (Christy & Norris Ltd., Chelmsford, England). The flour obtained was labeled and stored in a refrigerator for subsequent use (ABA, 2008).

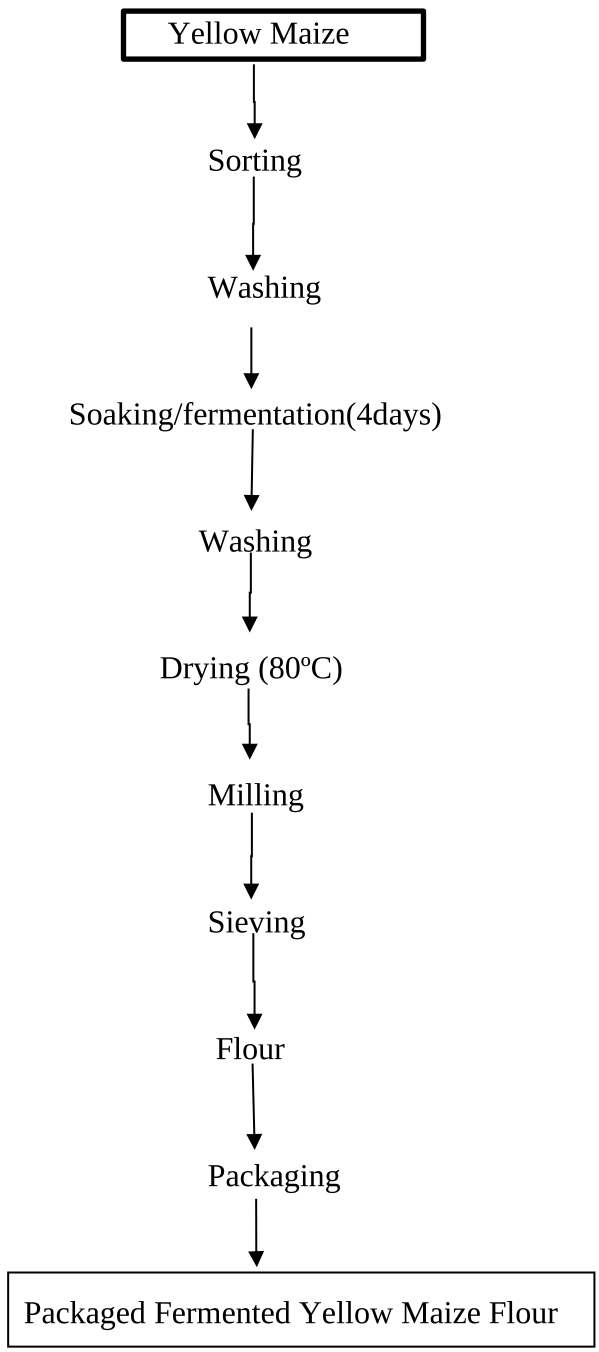

Fig. 1: **Flow Chart for Production of Fermented Yellow Maize Flour (Modified)**
Source: Jeanne and Therese, (2011).

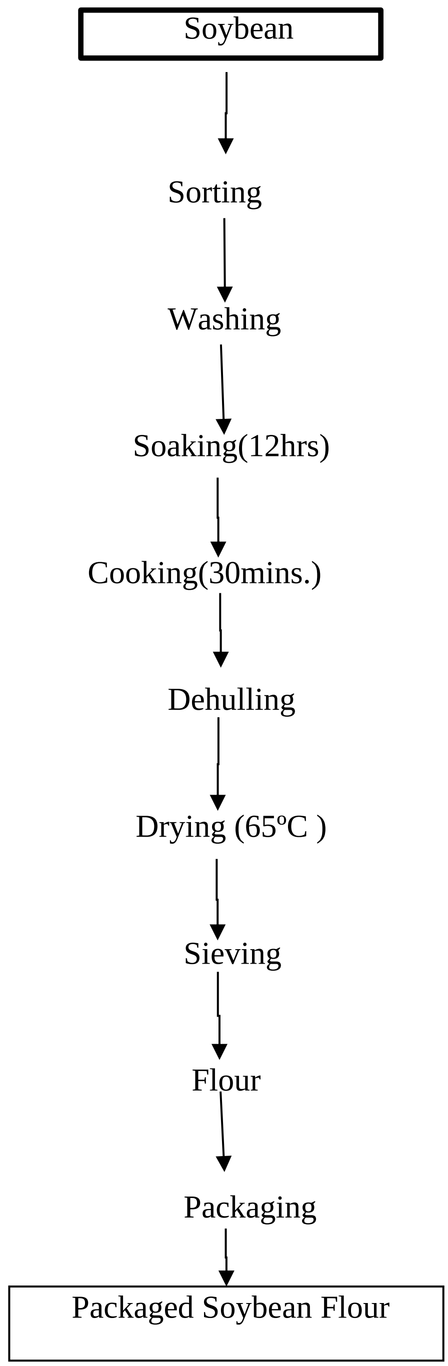

Fig. 2: Flow Chart for Production of Soybean Flour **(Modified)**
Source: Barber *et al*., (2017).

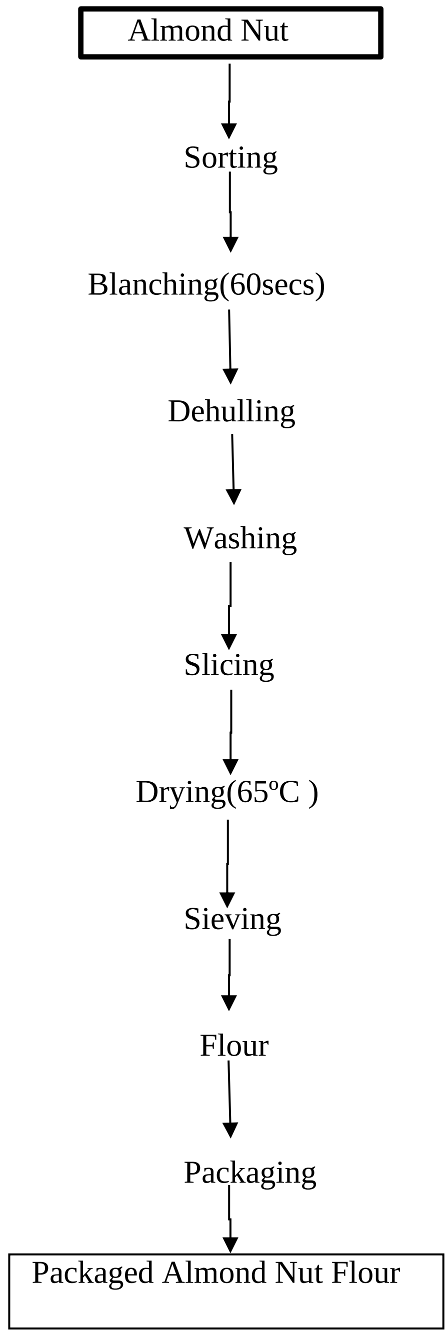

Fig. 3: **Flow Chart for Production of Almond Nut Flour (Modified)**
Source: ABA, (2008).

3.0 FORMULATION OF FLOUR BLENDS.

A composite blends of fermented yellow maize and soybean (FYMF - SBF) was made at the ratio of 70:30 respectively. A ratio which has been reported in literature to give acceptable nutritional and sensory qualities. Samples for weaning food production were blended at different levels at the ratios of 100:0 = A, 95:5 = B, 90:10 = C, 85:15 = D, 80:20 = E, for fermented yellow maize - soybean composite flours : almond nut flour respectively. A weighing balance and blender were used for weighing and mixing the flour respectively. The blending ratio is shown in Table below;

Sample Formulation

Samples	A	B	C	D	E
FYMF - SBF	100	95	90	85	80
ANF	0	5	10	15	20

Key: FYMF - SBF = Fermented Yellow Maize - Soybean Composite Flour; ANF = Almond Nut Flour

3.1. Preparation of Weaning Food from Composite Flour Blends

Weaning foods (gruel) were produced from the five (5) formulated flour blends. Cold water was added to dissolve each flour blend. Hot water was thereafter introduced into the mixture and placed on the fire. Continuous stirring was done until a uniform gel was obtained.

3.2. Determination of functional properties of the flour blends

Water absorption capacity,oil absorption capacity and gelatinization temperature were determined using the method by Onwuka (2005). Swelling index was determined using the method described by Abbey and Ibeh (1988) while foam capacity was determined using the method of AOAC (2005).

3.3. Proximate Analysis

Moisture content, total ash, fat, and crude protein were determined using the method described by AOAC (2005) while carbohydrate content was determined by difference using the method of (Ihekoronye and Ngoddy, 1985).

3.4. Total Energy Determination

The caloric value was calculated using the Atwater factor as described by Osborne and Voogt (1978). The formula is as follows;

Caloric value = protein x 4 + fat x 9 + carbohydrate x 4

3.5. Determination of Mineral Content

The minerals Fe, Ca, Mg, and K were determined using atomic absorption spectrophotometer as described by Fraga *et al.*, (2004).

3.6. Sensory Evaluation of the Gruel

Sensory characteristics of the coded gruel were evaluated for different sensory attributes by twenty (20) semi-trained panelists drawn from the Department of Food Science and Technology, University of Uyo of whom five (5) were nursing mothers. All the panelists were briefed before the commencement of the evaluation process. Sensory attributes evaluated were appearance, flavour, mouthfeel, consistency and general acceptability. The rating was on a nine- point hedonic scale ranging from 9 (like extremely) to 1 (dislike extremely) (Ihekoronye and Ngoddy , 1985). All panelists were regular consumers of maize gruel, water at room temperature was provided to rinse the mouth between evaluations. Data obtained were statistically analyzed to determine the level of general acceptability.

3.7. STATISTICAL ANALYSIS

The data collected were subjected to statistical analysis using analysis of variance (ANOVA) to determine whether there was any significant difference ($p < 0.05$). The means was then separated with the use of New Duncan's Multiple Range Test (DMRT) using the Statistical Package for the Social Sciences (SPSS) version 20.0 software.

4.0. RESULTS AND DISCUSSION

4.1. Functional Properties of Fermented Yellow Maize and Soybean Composite Flours, Fortified with Almond Nut Flour for Production of Weaning Foods.

Table 1 shows the result of functional properties of the flour blends. Water absorption capacity increased with increase in almond nut flour substitution ranging from 6.33 g/g in sample A to 12.67 g/g in sample E . Higher water absorption capacity indicates higher protein content in the formulations, which absorbs and binds with more water (Otegbayo *et al*., 2000). Almond seed has high protein digestibility **(**Garcı´a-Lorda *et al.*, 2003) as seen in sample D and E. The reduction in water absorption value observed in sample A(control), B and C could be due to the low protein content as water absorption capacity is the ability of protein in a product to associate with and retain water.However, low water absorption capacity values are desirable for making thinner gruels (Obasi *et al.*, 2018).

Oil absorption capacity is an important functional property as the ability of flour to absorb and retain oil may enhance flavour retention and improve mouthfeel (Kaur *et al*., 2013). Significant ($p < 0.05$) difference was observed among the samples, with sample A having the highest value 24.33 g/g.

The swelling capacity content of the weaning food also varied with the composition of the flours in the blends (Table 1), weaning food from composite flour blends of 70% fermented yellow maize and 30% soybean (sample A) had the highest value and sample E (80% fermented yellow maize-soybean-composite flours and 20% almond nut flour) had the least value, its decreases with increasing level of almond nut flour inclusion. Complementary foods do not require high swelling capacity as the food would absorb more water and have less solid resulting in low nutrient density for the infant (Ojinnaka *et al.*, 2013).

The foaming capacity showed significant ($P < 0.05$) difference from the control, it ranged from 17.61% in sample A to 42.73% in sample E. Foaming capacity is used to determine the ability of the flour to foam which is dependent on the presence of the flexible protein molecules which decrease the surface tension of water (Asif- Ul- Alam *et al.*, 2014). It increases with the addition of almond flour.

The Gelatinization temperature of sample C and D were not significantly different from each other. Sample A, B and E were significantly different from each other, all at $p < 0.05$. High temperature presented in this study could have been due to a reduced starch content of the flours which may have occurred during sprouting. (Chandra *et al.,* 2015) as temperature increased with increased level of substitution.

Table 1. Functional Properties of the Flour Blends for Weaning Food Production

Sample	Water absorption (g/g)	Oil absorption (g/g)	Swelling Capacity (%)	Foaming Capacity (%)	Geltinization Temperature (^{0}C)
A	6.33^e±0.58	24.33^a±0.58	66.66^a±0.08	17.61^e±0.09	75.67^d±0.58
B	8.33^c±0.58	21.67^b±0.58	60.14^b±0.13	23.28^d±0.07	78.33^c±0.58
C	9.33^{bc}±0.58	20.00^c±0.00	56.13^c±0.05	36.18^c±0.09	80.00^b±0.00
D	10.33^b±0.58	18.67^d±0.58	50.20^d±0.30	38.86^b±0.77	80.67^b±0.58
E	12.67^a±0.58	16.33^e±1.15	45.56^e±0.19	42.73^a±0.14	83.33^a±0.58

Blending ratio**:** A = 100:0 (Control); B = 95:05; C = 90:10; D = 85:15; E = 80:20 of fermented yellow maize - soybean composite and almond nut flour blends

4.2. Proximate Composition of Fermented Yellow Maize and soybean Composite Flours, Fortified with Almond Nut Flour for Production of Weaning Foods.

The results of the proximate composition of fermented yellow maize and soybean composite flours, fortified with almond nut flour for production of weaning foods.
indicated in Table 2. The moisture content ranged from 5.86% (sample A the control) to 9.17% (sample E).The higher moisture content in the composite flour products relative to the control may be attributed to the blend composition of the composite flour. The moisture contents for all the blends are about the recommended level for safe keeping of samples by the Standards Organization of Nigeria (SON) and shows that they will have better keeping quality as moisture content in excess of 14% in flours has greater danger of bacterial action and mould growth which produce undesirable changes in the flour (Ihekoronye and Ngoddy, 1985). Low moisture content possesses better shelf life and denser nutrient composition (Muyanja *et al*., 2012; Zakpaa *et al*., 2010 and Kikafunda *et al*., 2006) and therefore enhance the storage stability of the flour.

The crude lipid content increased with increasing level of almond nut flour substitution, formulated sample values were higher than 3.70% as reported by Agunbiade and Ojezele, (2010) using maize, sorghum and soybean breakfast cereal but was within the range reported by Nwokem *et al., (*2019) using cereals enriched with dates for baby food. Lipids are important in the diets of infants and young children as it provides high energy density and facilitates the absorption of fat-soluble vitamins. It also provides essential fatty acids such as omega-3 and omega-6 polyunsaturated fatty acids (PUFA) 55 needed for proper neural development in infants and young children (Igyor *et al*., 2011). Low fat is beneficial as it ensures long product shelf life by reducing susceptibility to oxidative rancidity. It has been recommended that, during the complementary feeding period (6 – 12 months) a child's diet should derive 30 – 40 % of energy from fat (Michaelsen *et al*., 2000).

Ash content ranged from 3.90 to 6.35 % with the formulated blends having the highest value and the values increases with increased in almond nut flour.The obtained results are comparable with the results published by Aderonke *et al*. (2014) for complementary diets prepared from soybean, maize, and pigeon pea. The results of the present study, sample A to D are in the recommended range, according to the Protein Advisory Group of the United Nations System, (1972) the ash content of weaning foods should not exceed 5%. The ash content of a food material could be used as an index of mineral constituents of the food (Fusuan *et al.*, 2017). Significant $p < 0.05$ difference was observed among the samples.

The fibre content was found to be 14.16% in sample E which is higher than the fibre content of the control found as 8.89% sample A. Crude fibre is one of the non-energy yielding nutrients, it helps to increase the nitrogen utilization and absorption of some micronutrients (Michaelsen *et al.*, 2000). It was higher than a work 0.20-4.40% reported by Obinna-Echem *et al*., (2018) using malted pre-gelatinized maize, soybean and carrot flour. Fiber is an important dietary component in preventing overweight, constipation, cardiovascular disease, diabetes and colon cancer (Mosha *et al*., 2000).

The obtained results indicate that the protein content significantly ($p < 0.05$) varied from 12.46% to 27.88% for formulated weaning foods. It increases with the substitution of almond nut flour in the blends.. According to WHO/FAO Reddy *et al.*, (1984) a minimum of 15% protein and a maximum of 25% are needed for the best complementation of amino acids in growth and foods (Sanni *et al*., 1999). So, this formulation, satisfy the necessary demand for protein for infants. The impact of almond nut flour addition obviously increased the bio-nutrient of the composite flour. This result is expected since almond flour is a rich source of protein, the result is an agreement with a work done by Ogunjemilusi *et al*.,2023. The percentage protein is equally high enough to prevent protein-energy malnutrition in an adult who depends on it as its protein source. The composite blends may be another cheap source of plant protein for the marginal resource communities of Nigeria. Effiong *et al.*, (2009) stated that any plant food that provides about 12% of the caloric value from protein are considered good sources of protein.

Carbohydrate content contributes to the bulk of the energy of the formulation. The high carbohydrate contents of the samples observed in this study are nutritionally desirable as children require energy to carry out their rigorous physical and physiological activities as growth continues (Ibironke *et al.,* 2012).The carbohydrates content ranges from 24.51%(sample E) to 56.04(sample

A) is similar to a work reported by Emeka *et al*. (2022) for maize-soybean complementary foods fortified with crayfish, bonga fish and carrot flours.

Energy values obtained are within the range 362.29 to 385.45 Kcal, the values of the composite flours were higher than that of the control (sample A). The results were similar to that reported by Obasi *et al.* (2018) using sprouted paddy rice, sprouted African yam bean and pawpaw and that of (Noraidah *et al.*, 2023). Significant ($p < 0.05$) different was observed among the flours with sample E having the highest energy value. These values represent the amount of energy in food that can be supplied to the body for maintenance of basic body functions such as breathing, circulation of blood and physical activities.

Table 2. Proximate Composition of Fermented Yellow Maize and soybean Composite Flours, Fortified with Almond Nut Flour for Production of Weaning Food

Sample code	Moisture (%)	Ash (%)	Fibre (%)	Lipid (%)	Protein (%)	Carbohydr-ate (%)	Energy (Kcal/100g)
A	5.86^{e}±0.56	3.90^{e}±0.06	8.89^{e}±0.06	9.81^{e}±0.05	12.46^{e}±0.05	59.08^{a}±0.10	374.45^{e}±0.32
B	6.12^{d}±0.04	4.43^{d}±0.09	9.37^{d}±0.04	11.15^{d}±0.06	15.37^{d}±0.06	53.56^{b}±0.18	376.07^{d}±0.78
C	6.84^{c}±0.04	4.93^{c}±0.04	11.35^{c}±0.06	15.84^{c}±0.05	19.64^{c}±0.06	41.40^{c}±0.14	386.72^{a}±0.04
D	8.56^{b}±0.06	5.65^{b}±0.06	12.89^{b}±0.04	17.91^{b}±0.04	25.18^{b}±0.03	29.81^{d}±0.07	381.15^{b}±0.58
E	9.17^{a}±0.06	6.35^{a}±0.06	14.16^{a}±0.06	19.54^{a}±0.31	27.89^{a}±0.03	22.89^{e}±0.06	378.5^{c}±0.11

Blending ratio**:** A = 100:0 (Control); B = 95:05; C = 90:10; D = 85:15; E = 80:20 of fermented yellow maize - soybean composite and almond nut flour blends.

4.3. Mineral Contents (mg/100g) of Fermented Yellow Maize and soybean Composite Flours, Fortified with Almond Nut Flour for Production of weaning foods.

The mineral content of fermented yellow maize and soybean composite flours, fortified with almond nut flour for production of weaning foods are presented in Table 3. Calcium is an essential element in infants and young children for building bones and teeth, functioning of muscles and nerves, blood clotting and for immune defense (Whitney *et al.*, 1990). The Calcium (Ca) content of the composite flours rate higher than the control, it ranged from 249.10 mg/100g in sample A(control) to 368.35 mg/100g in sample E. The calcium level is within the range as reported by Nwokem *et al*., (2019) using cereals enriched with dates for baby food. The values are within the required daily intake (RDI) for an infant as reported by the dietary guidelines of the (Food and Nutrition Board of the Institute of Medicine National Academy of Science, 1997 – 2001).

The Potassium (K) content of the composite flour varied significantly ($p < 0.05$) different with the levels of individual flours in the blends, it ranged from 475.70 mg/100g in sample A to 728.57 mg/100g in sample E, it increases with increasing level of the forticant (almond nut flour) which is a rich source of potassium and other minerals (Garcı´a-Lorda *et al.*, 2003). Potassium content achieved, is in line with a research work reported by Lawal *et al*.,(2021) using plant-based milk to produce infant weaning food. It falls within the ranged as recommended by Codex Alimentarius Standards (FAO/WHO, 1994).

Iron (Fe) content varies from 24.86 mg/100g in sample A to 40.70 mg/100g in sample E, the formulated samples had values higher than the control. Grosvernor and Smolin (2002) reported that Iron function as part of hemoglobin, which transport oxygen in the blood and myoglobin, which enhances the amount of oxygen available for use in muscle contraction. Inadequate iron levels in the body leads to a disease condition known as iron deficiency anemia which is a common nutritional deficiency especially among children and women worldwide as well as vitamin A deficiency (Sanoussi *et al*., 2013).

Magnesium content ranged from 61.27 mg/100g in sample A to 87.67 mg/100g in sample E. significantly ($p < 0.05$) different was observed between the fortified flour blends and the control. Minerals are vital for the overall mental and physical well-being and are important constituents of bones, teeth, tissues, muscles, blood and nerves cells (Soetan *et al.*, 2010). They generally help in the maintenance of acid-base balance, the response of nerves to physiological stimulation and blood clotting (Hanif *et al.*, 2006).

Table 3. Mineral Contents (mg/100g) of Fermented Yellow Maize and soybean Composite Flours, Fortified with Almond Nut Flour for Production of weaning foods.

Sample	Potassium	Magnesium	Calcium	Iron
A	$475.70^{d} \pm 0.03$	$61.27^{c} \pm 0.02$	$249.10^{d} \pm 17.59$	$24.86^{c} \pm 30.69$
B	$506.36^{c} \pm 0.00$	$65.00^{c} \pm 20.70$	$271.87^{c} \pm 0.02$	$31.32^{b} \pm 31.69$
C	$532.03^{c} \pm 0.00$	$75.87^{b} \pm 0.00$	$293.34^{c} \pm 0.03$	$38.17^{a} \pm 41.67$
D	$665.39^{b} \pm 0.00$	$76.22^{b} \pm 1.41$	$325.87^{b} \pm 0.02$	$39.18^{a} \pm 44.56$
E	$728.57^{a} \pm 0.01$	$87.67^{a} \pm 0.03$	$368.35^{a}\pm0.01$	$40.70^{a} \pm 49.48$

Blending ratio**:** A = 100:0 (Control); B = 95:05; C = 90:10; D = 85:15; E = 80:20 of fermented yellow maize - soybean composite and almond nut flour blends.

4.4. Sensory Properties of the Weaning Foods Produced from the Blends of Fermented Yellow Maize and Soybean Composite, Fortified with Almond Nut Flour.

Data in table 4, depict the mean sensory scores of the weaning food produced from blends of fermented yellow maize and soybean composite, fortified with almond nut flour are presented in

Table 4. The result shows that the weaning food produced from 70% and 30% fermented yellow maize and soybean composite flour had a mean value of 7.45 (sample A) for consistency as compared to weaning food produced from composite flour of 85% FYMF and SBF, fortified with 15% ANF in sample D, which had a mean value of 8.60. The mean score for flavour ranged from 7.30 in sample A to 8.60 in sample E, sample D and sample E was significantly ($p < 0.05$) higher than sample A (Control), B and C. The mean score for appearance ranged from 7.65 in sample A to 8.80 in sample E, Appearance is very important as a sensory property which contributes to acceptability and choice of food. The mean score for flavour ranged from 7.30 in sample A to 8.60 in sample E. Sample E was significantly ($p < 0.05$) different from other samples of the weaning food produced from yellow maize, and soybean composite flour, fortified with almond nut flour in mouthfeel and general acceptability, but was not significantly ($p < 0.05$) different from sample D, in mouthfeel and overall acceptability. The fortified samples were the most preferred samples, especially sample D (which comprises of 85% fermented yellow maize-soybean composite flours and 15% of almond nut flour) and E (which comprises of 80% fermented yellow maize-soybean composite flours and 20% of almond nut flour).

Table 4. Sensory Properties of the Weaning Foods Produced from the Blends of Fermented Yellow Maize and Soybean Composite, Fortified with Almond Nut Flour.

Sample	Consistency	Flavour	Appearance	Mouthfeel	General Acceptability
A	$7.45^{c}±1.10$	$7.30^{c}±0.98$	$7.65^{c}±0.99$	$5.80^{d}±0.89$	$6.75^{d}±0.72$
B	$8.00^{b}±0.65$	$7.80^{bc}±0.95$	$8.00^{bc}±1.03$	$6.90^{c}±1.07$	$7.75^{c}±0.64$
C	$8.20^{ab}±0.62$	$8.15^{ab}±0.88$	$7.95^{bc}±1.43$	$7.40^{b}±0.60$	$8.00^{bc}±0.73$
D	$8.60^{a}±0.60$	$8.45^{a}±0.83$	$8.45^{ab}±0.76$	$8.00^{a}±0.56$	$8.20^{ab}±0.62$
E	$8.55^{a}±0.69$	$8.60^{a}±0.50$	$8.80^{a}±0.41$	$8.20^{a}±0.62$	$8.50^{a}±0.69$

Blending ratio**:** A = 100:00 (Control); B = 95:05; C = 90:10; D = 85:15; E = 80:20 of fermented yellow maize - soybean composite and almond nut flour blends.

CONCLUSION

The Incorporation of almond nut flour in the flour blends increased the protein, vitamin and mineral contents in the weaning food. From this research work, it may be concluded that the use of composite flour of fermented yellow maize and soybean composite blends, fortified with almond nut flour to produce acceptable weaning food will go a long way to increase weaning food variety, boost their nutritional contents, eradicate mineral deficiencies and increases the utilization of these crops. The use of these locally grown crops to produce weaning food will go a long way in reducing Nigeria's dependence on imported weaning food thereby reducing foreign exchange used in importing and may generate employment opportunities. Also being made available even to the low-income earners since commercial weaning food is gradually getting out of the reach for these families because it is very expensive to purchase.

RECOMMENDATION

Based on this study, the following are recommended:

1. I recommend weaning food produced from composite flour of sample D (which comprises of 85% fermented yellow maize and soybean composite flours with 15% of almond nut flour) and sample E (which comprises of 80% fermented yellow maize and soybean composite flours with 20% of almond nut flour) to the public as it will help reduce the problem of macro and micro-nutrient deficiencies for weaning food production.
2. In-depth study should be carried out to divulge the nutritional and health benefit of almond nut, also, I suggest public enlightenment on the nutritional importance of almond nut, since it seems not to be known by many.

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